APPENDIX D - RADIOACTIVE TRACER SURVEY ON WDW-49 (WELL NO. 4) WITH WESTERN ATLAS INTERPRETATION LETTER

DIAGNOSTIC RADIOACTIVE TRACERLOG

Hoechst Celanese Chemical Group, Inc.
Well #4
Bay City Plant
Matagorda County, Texas

Prepared for
ECO Solutions, Inc.
Houston, Texas

ATLAS WIRELINE SERVICES
WESTERN ATLAS INTERNATIONAL

March 11, 1994

Prepared by Freeman Hill, III

DISCLAIMER

In making interpretations of logs, our employees will give Customer the benefit of their best judgement, but since all interpretations are opinions based on inferences from electrical or other measurements, we cannot, and we do not guarantee the accuracy or the correctness of any interpretation. We shall not be liable or responsible for any loss, cost, damages, or expenses whatsoever incurred or sustained by the Customer resulting from any interpretation made/by any of our employees.

Disposal Well Background

The Hoechst Celanese Chemical Group, Inc.'s Injection Well #4, located at the Bay City facility has been used for underground injection. In addition to surface casing string, the well contains a string of 7-5/8 inch OD casing cemented to 3368 ft and 5.5 inch tubing and packer assembly, located at 3316 ft. and 4.5 screen from 3371 ft to 3579 ft.

A logging program consisting of a Radioactive Tracer ejector and detector instrument was used to evaluate the integrity of the casing and cement and to verify that the injection interval had accepted the disposed fluids.

Radioactive Tracerlog Survey

1. Logged API gamma ray from well depth of 3136 ft to 3428 ft.

   Purpose: Base-line for radioactive tracer instrument and post survey.

   Analysis: Gamma ray instruments respond to naturally occurring radiation (e.g., potassium, uranium, thorium) found in formations. Normally, shaly formations tend to contain more of these gamma ray-producing elements than a sand formation.

2. Logged gamma ray detectors off Radioactive Tracerlog from well depth of 3000 ft. to 3433 ft.

   Purpose: A base-line for radioactive tracer instrument.

   Analysis: Baseline check - good. There were not any anomalies.

3. Repeat Step 2.

   Analysis: No anomalies noted.

4. While injecting into the well at 10 gpm, radioactive material (Iodine -131) was ejected from radioactive tracer instrument at 3000 ft. The instrument was lowered further into the well and then logged in the upward direction in order to intercept and detect the radioactive slug as it moved down the well. By repeating this process of lowering the instrument and logging in the upward direction, the radioactive slug was traced through the casing packer and into the injection interval located below.

   Purpose: Ensure injected fluids move through the tubing in a downward direction and that no upward or out of zone fluid movement through a cement channel is detected.

Analysis: The following table depicts the depths where the detector intercepted the radioactive slug as it moved with the surface-injected fluids downward toward the injection interval.

File #	Interception Depth ft. (Bottom Detector)
8	3050
9	3129
10	3232
11	3333
12	3432 Tail End
13	---- Tail End
14	Just about gone - No trace of radioactive material above.

The radioactive peak responses from the first pass, file # 8, to file # 14 the last pass, become smaller, but cover a longer vertical interval, due to the movement of the wireline and instrument mixing the radioactive slug with the injected fluids. The radioactive material appears to continually move in the downward direction and into the disposal interval. There is no evidence of any problems.

5. Repeat step 4 (Chase Survey). (Pump Rate = 10 GPM)

Purpose: Ensure injected fluids move through the tubing in a downward direction and that no channel activity (fluid movement) to other zones above the target interval is detected.

Analysis: The following table depicts the depths where the detector intercepted the second radioactive slug (ejected at 4681 ft) as it moved with the injected fluids downward toward the injection interval.

File #	Interception Depth ft. (Bottom Detector)
15	3060
16	3135
17	3219
18	3317
19	3418
20	---- Tail End
21	Just about gone - No trace of radioactive material above.

Again, the radioactive peak responses on the log become smaller (and wider) during the survey due to the mixing action of the wireline and instrument. The radioactive slug appeared to continuously move down to the disposal area. There is no evidence of any problems.

6. The tool was stationed at 3348 ft, above the disposal interval, for a stationary reading. The radioactive isotope is released and after the initial response to the isotope passing by the detector in a downward motion, then the isotope or an increase in radiation, should not be monitored again. If the isotope is seen again, then communication (channel behind pipe) is highly possible.

   Purpose: Ensure injected fluids move downward and not back up on the outside of casing in a channel, (Initial Pump Rate - 10 GPM; then increased to 120 GPM) (15-minute test).

   Analysis: After the initial response to the radioactive slug, the isotope slug did not come back into the tools' vicinity. No channel indicated.

   An incremental change in radiation was observed on the bottom detector only. This corresponds to the pump rate increase from 10 GPM to 100 GPM. The tool had to be pressure stabilized; during this event, some material leaked out ot the ejector cylinder.

7. Repeat step 6 (Stationary Reading). (Pump Rate - 120 GPM) (15-minute test).

   Purpose: Ensure injected fluids are not channeling up.

   Analysis: After the initial response to the radioactive slug, the isotope did not come back in the tools' vicinity. No channel indicated.

8. Repeat Step 7 (Stationary Pending) (Pump Rate - 120 GPM) (15-minute test).

   Purpose: Ensure injected fluids are not channeling up.

   Analysis: After the initial response to the radioactive slug, the isotope did not come back in the tool's vicinity. No channel indicated.

9. Logged gamma detectors from well depth 2906 ft. to 3426 ft.

   Purpose: Monitor any anomalies or change in background baseline.

   Analysis: No significant anomalies found on both detectors.

Conclusion:

In my opinion, the Hoecsht Celanese Well #4, located in the Bay City Plant, does not have any integrity problems that would result in disposed fluids migrating to intervals other than the injection zone. The logging program consisting of a radioactive tracer ejector and detector instrument should satisfy the annual mechanical integrity requirement.

Western Atlas International

ATLAS WIRELINE SERVICES

NUCLEAR TRACER LOG

FILE NO. 94062

API NO.

FINAL PRINT

COMPANY HOECHST CELANESE CORP.

WELL WELL NO. 4

FIELD BAY CITY

COUNTY MATAGORDA STATE TEXAS

LOCATION:
NA.

SEC NA. TWP NA. RGE NA.

OTHER SERVICES
GAMMA RAY

PERMANENT DATUM GROUND LEVEL ELEV. NA.

LOGGING MEASURED FROM KB. 12 FT. ABOVE P.D.

DRILLING MEASURED FROM KB

ELEVATIONS

KB NA.
DF NA.
GL NA.

DATE	11-MAR-94	
RUN	1	
SERVICE ORDER	123482	
DEPTH-DRILLER	3500	
DEPTH-LOGGER	3433	
BOTTOM LOGGED INTERVAL	3433	
TOP LOGGED INTERVAL	3000	
TYPE FLUID IN HOLE	BRINE	
SALINITY PPM CL.	NA.	
DENSITY LB/GAL.	NA.	
LEVEL	FULL	
MAX. REC. TEMP. DEG. F	NA.	
OPR. RIG TIME	6 HR	
EQUIP. NO. / LOC.	HL. 6411 | HOUSTON	
RECORDED BY	MCCLEMMON	
WITNESSED BY	B. HALL	

BOREHOLE RECORD

NO.	BIT	FROM	TO

FOLD HERE

CASING RECORD

SIZE	WGT	FROM	TO
5 1/2	20	0	3316
4 1/2	NA.	3371	3579

REMARKS RUN (1)

LOG CORRELATED TO IEL 5-14-69
FIRST SLUG WAS SHOT AT 3000' PUMP RATE WAS 10 GPM.
SEVEN PASSES WERE MADE, R/A MATERIAL TRAVELED DOWN HOLE.
SECOND SLUG WAS SHOT AT 3000' PUMP RATE WAS 10 GPM. HOLE.
SEVEN PASSES WERE MADE, R/A MATERIAL TRAVELED DOWN CHANGE FROM 10 GP
TWO STATIONARY SLUGS WERE SHOT AT 3348' PUMP RATE NOTE BOTTOM DET.
10 120 GPM. EJECTOR LEAKED ON PUMP RATE CHANGE. NOTE
THIRD STATIONARY SLUG WAS SHOT AT 3350', NO CHANNEL
ALL STATIONARY RUNS WERE RECORED AT 15 MIN. EACH.

EQUIPMENT DATA

RUN	TRIP	TOOL	SERIAL NO.	POSITION
1	1	CCL		

WELL DATA

WDW WELL NO. 4
PACKER 3316 - 3322
SCREEN 3371 - 3579
PBTD 3433

BACKGROUND GAMMA RAY PASS NO. 2

****

FILE: 3

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	3,6	FT,IN
BDET	0	FT,IN
CCL	17,0	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.
WELL NAME: WELL NO.4
SERVICE: F 150A FILE: 3 DATE: 03/11/94
REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1
TRIP: 1
TIME: 12:12:28
MODE: RECORD

CCL
0100

TEN (LBS)
5000 0

TDET (CPS)
0 500

BDET (CPS)
0 500

0290

BDET (CPS)

500

0

02900

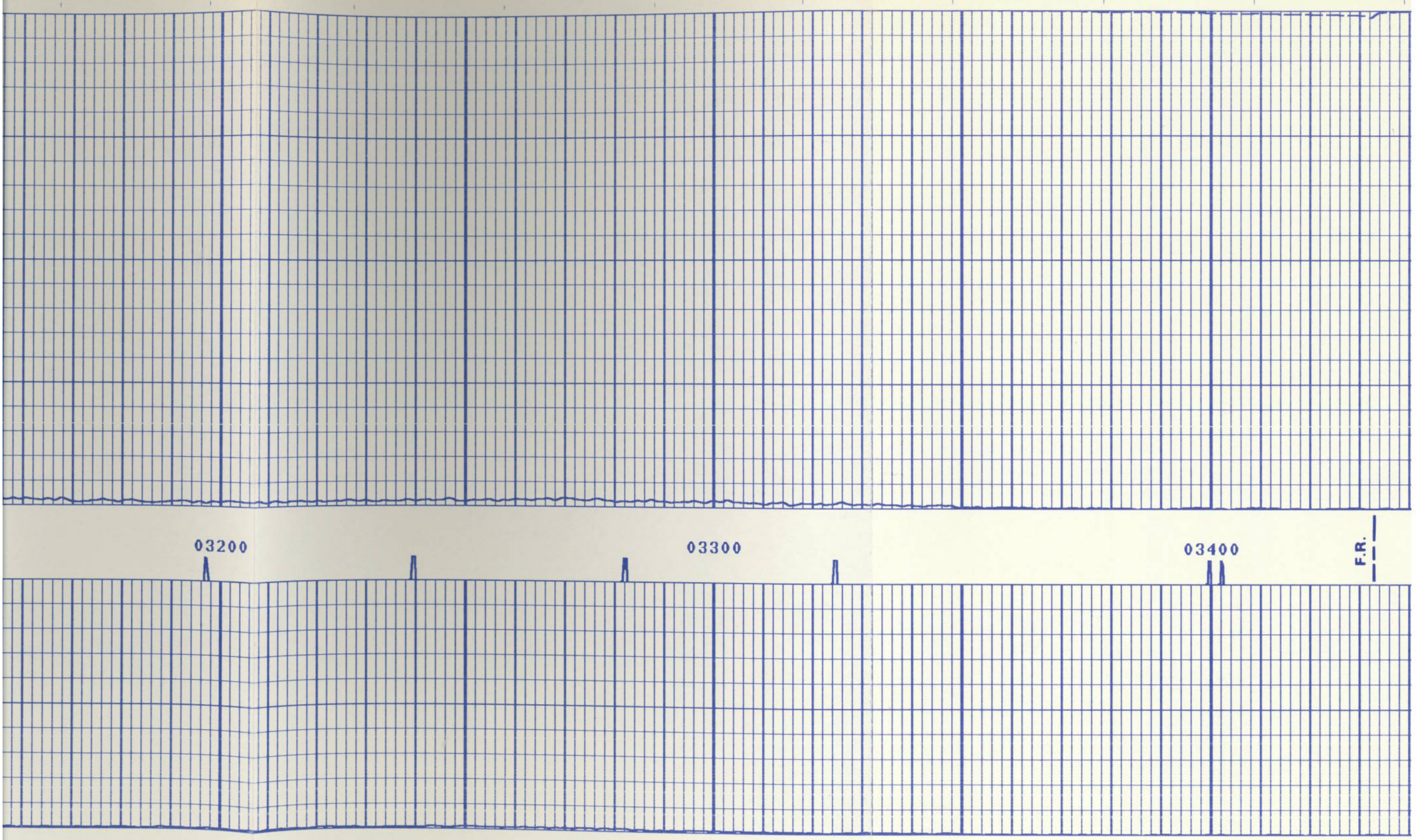
03000

03100

TDET (CPS)

500

0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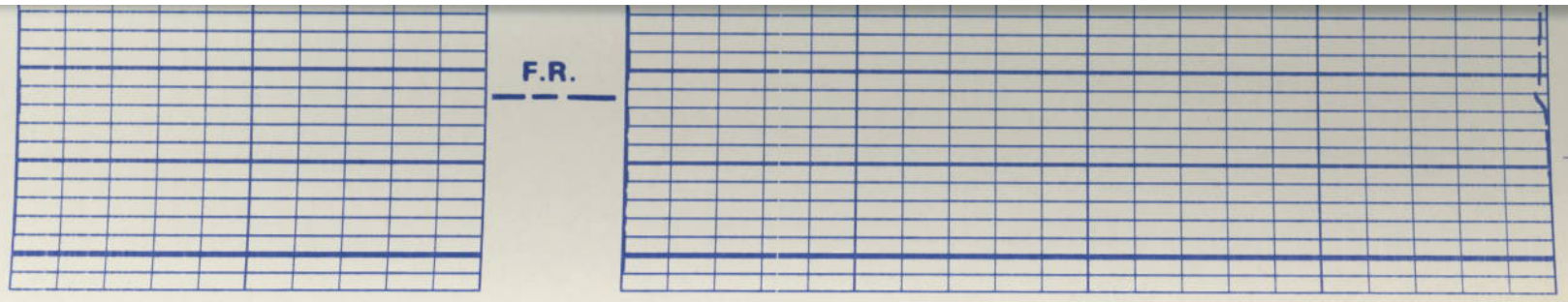
03300
03400
F.R.



CCL

0100

TEN (LBS)

5000 0

TDET (CPS)

0 500

BDET (CPS)

0 500

FILE: 3

****

BACKGROUND GAMMA RAY PASS NO.1

****

FILE: 2

CURVE DELAY REPORT

CURVE	PHYS. DELAY	UNITS
TDET	3,6	FT,IN
BDET	0	FT,IN
CCL	6,6	FT,IN

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

WELL NAME: WELL NO.4

SERVICE: F 150A FILE: 2 DATE: 03/11/94

REVISION: FSYS256 REV:G002 VER:2.0

RUN: 1

TRIP: 1

TIME: 11:52:38

MODE: RECORD

CCL

0100

TEN (LBS)

5000 0

TDET (CPS)

0 500

BDET (CPS)

0 500

TEN (LBS)

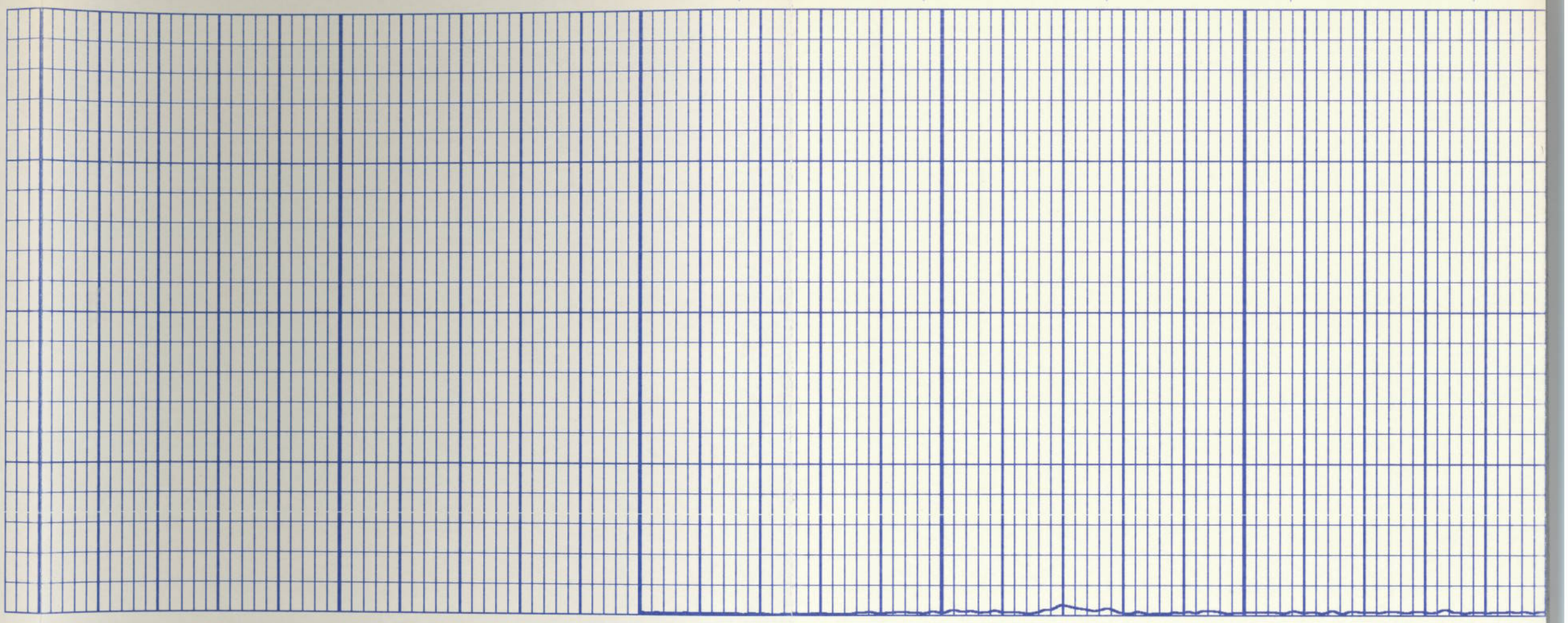
0

5000

BDET (CPS)

500

0



CCL

0100

02900

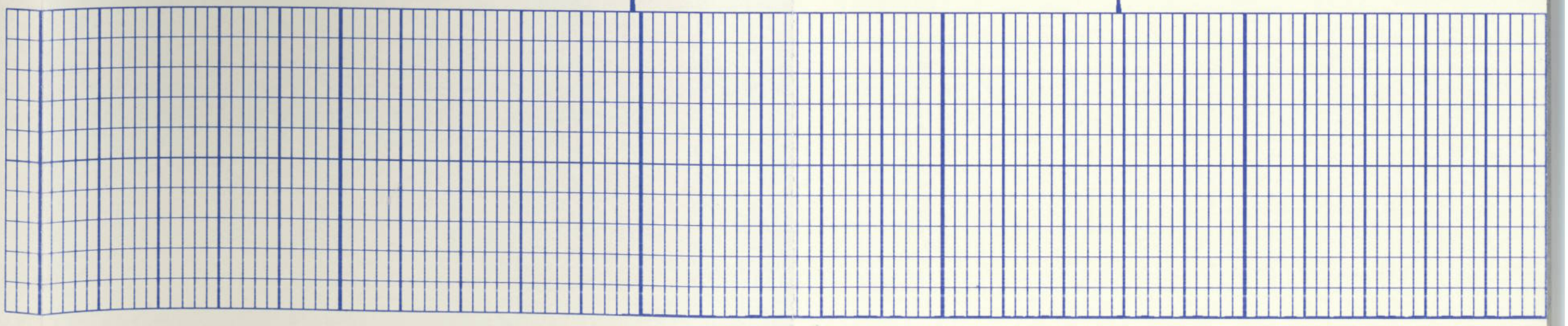
03000

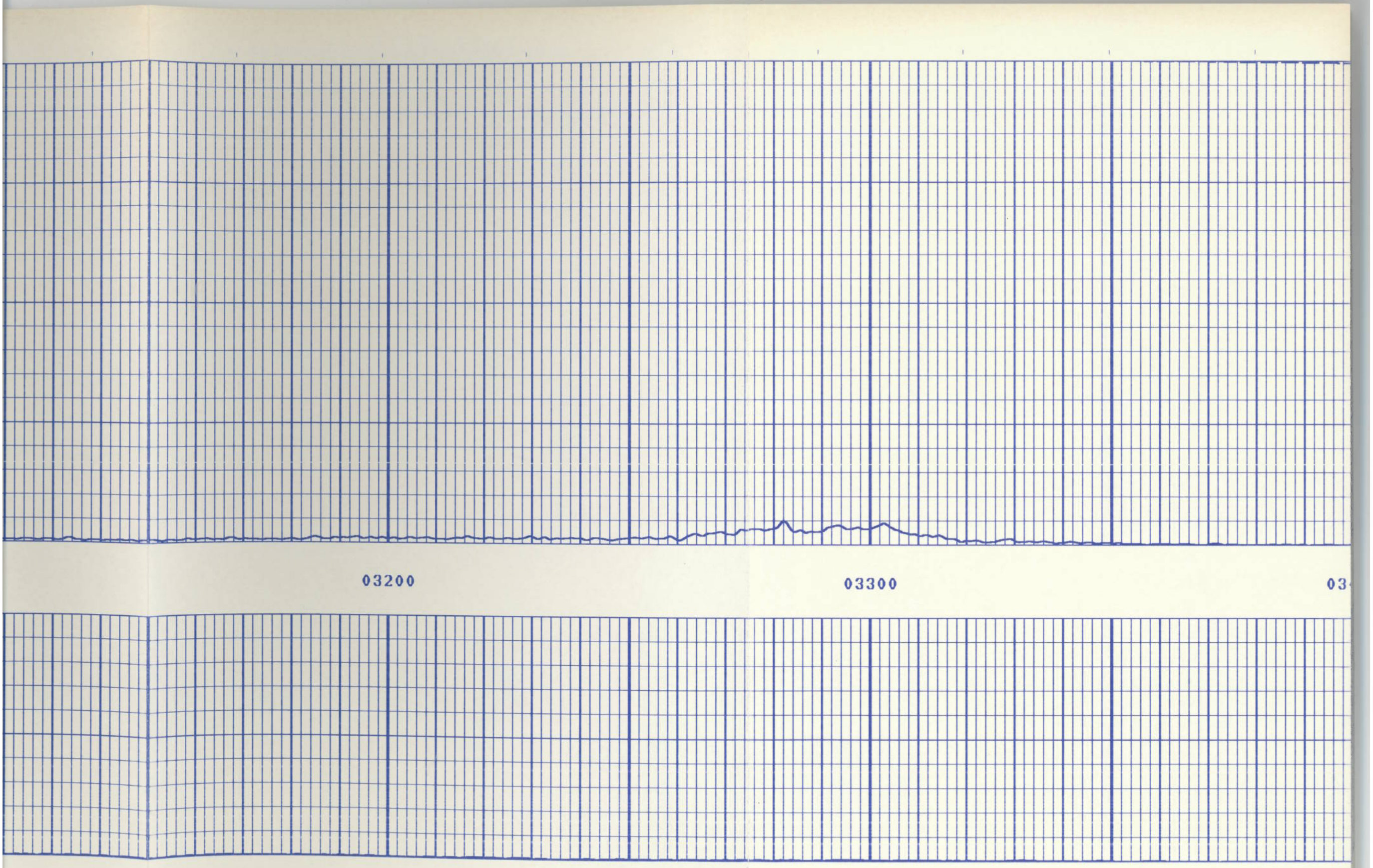
03100

500

TDET (CPS)

0

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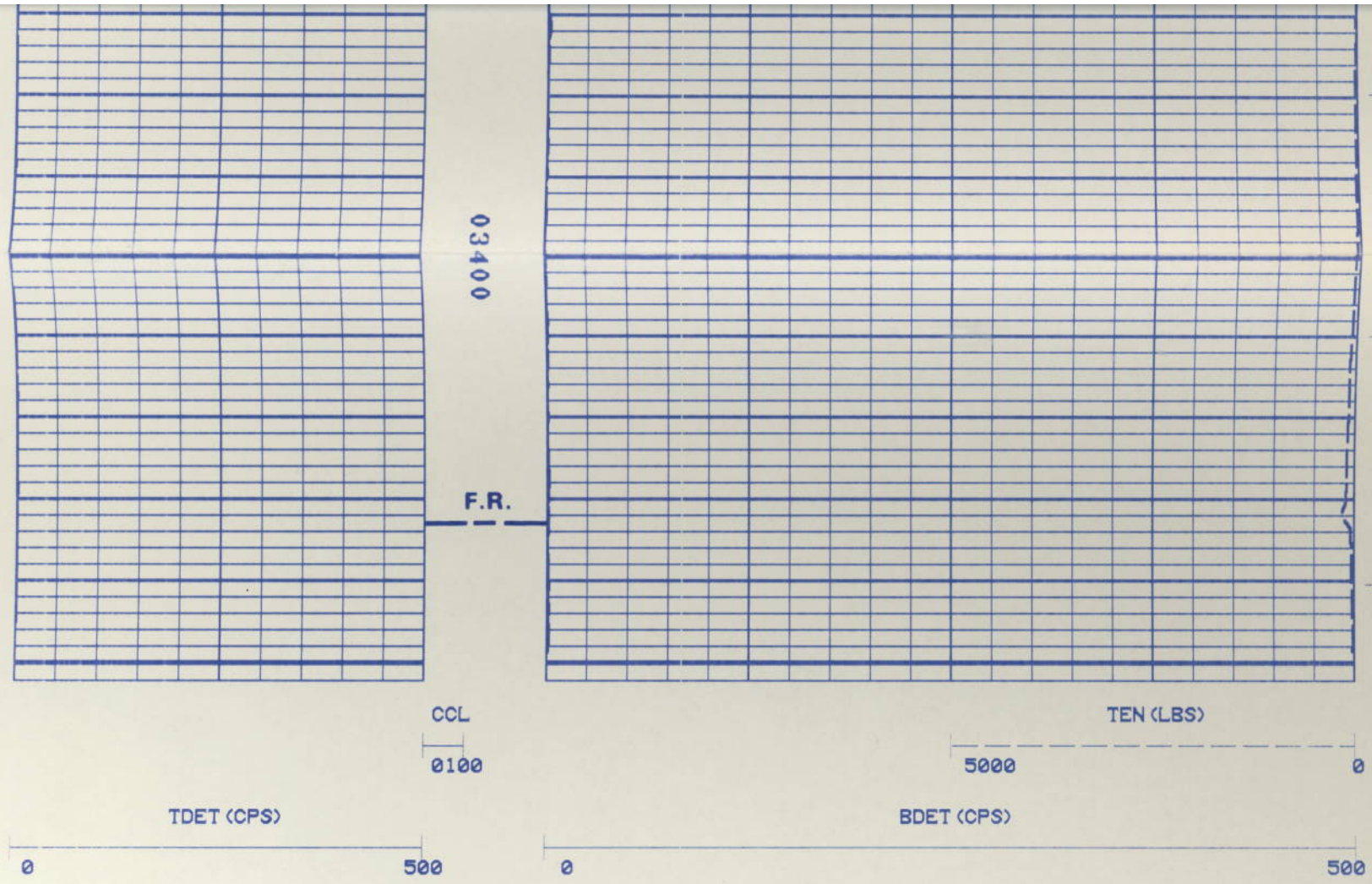
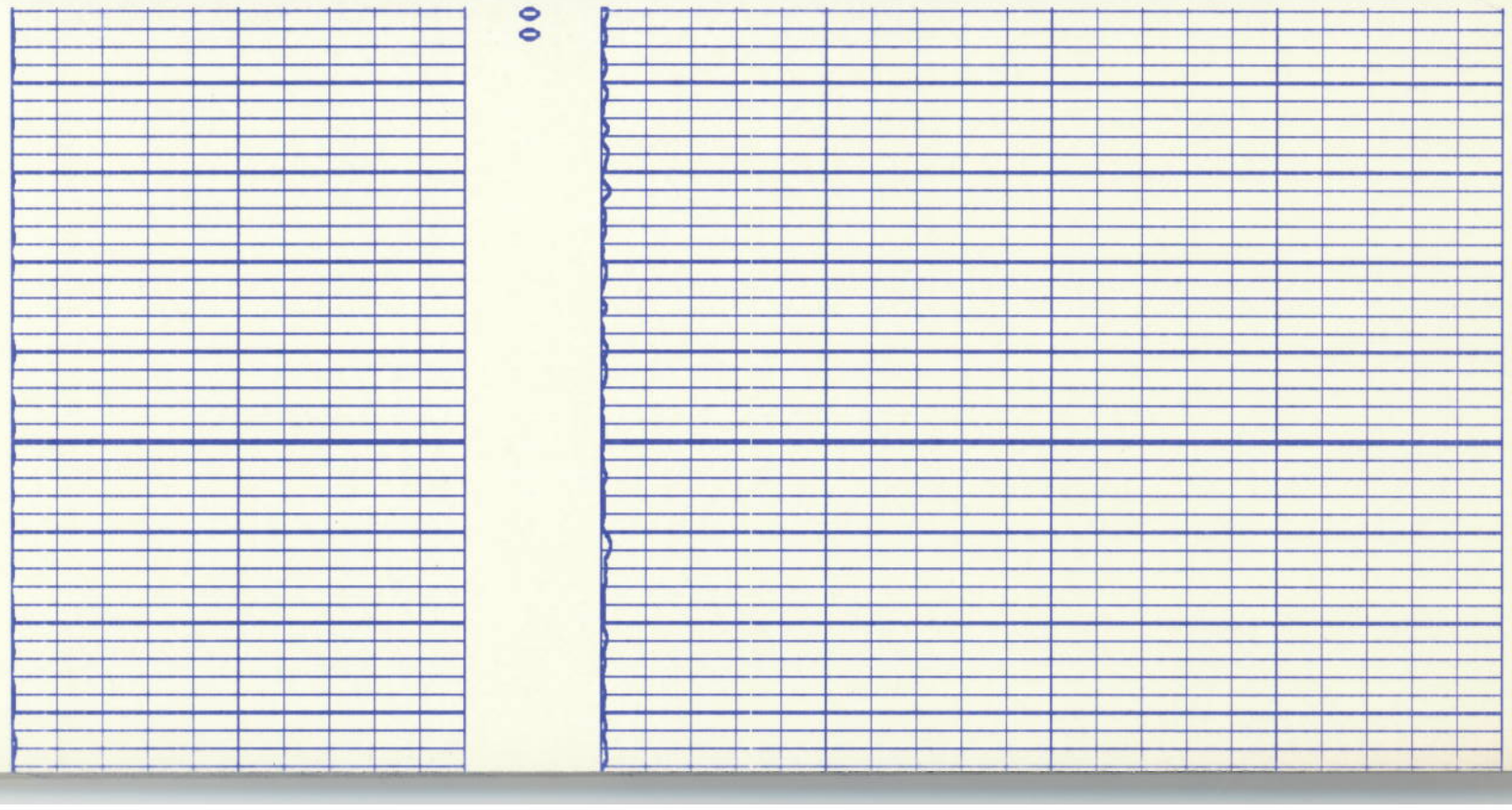
03300
03



FILE: 2

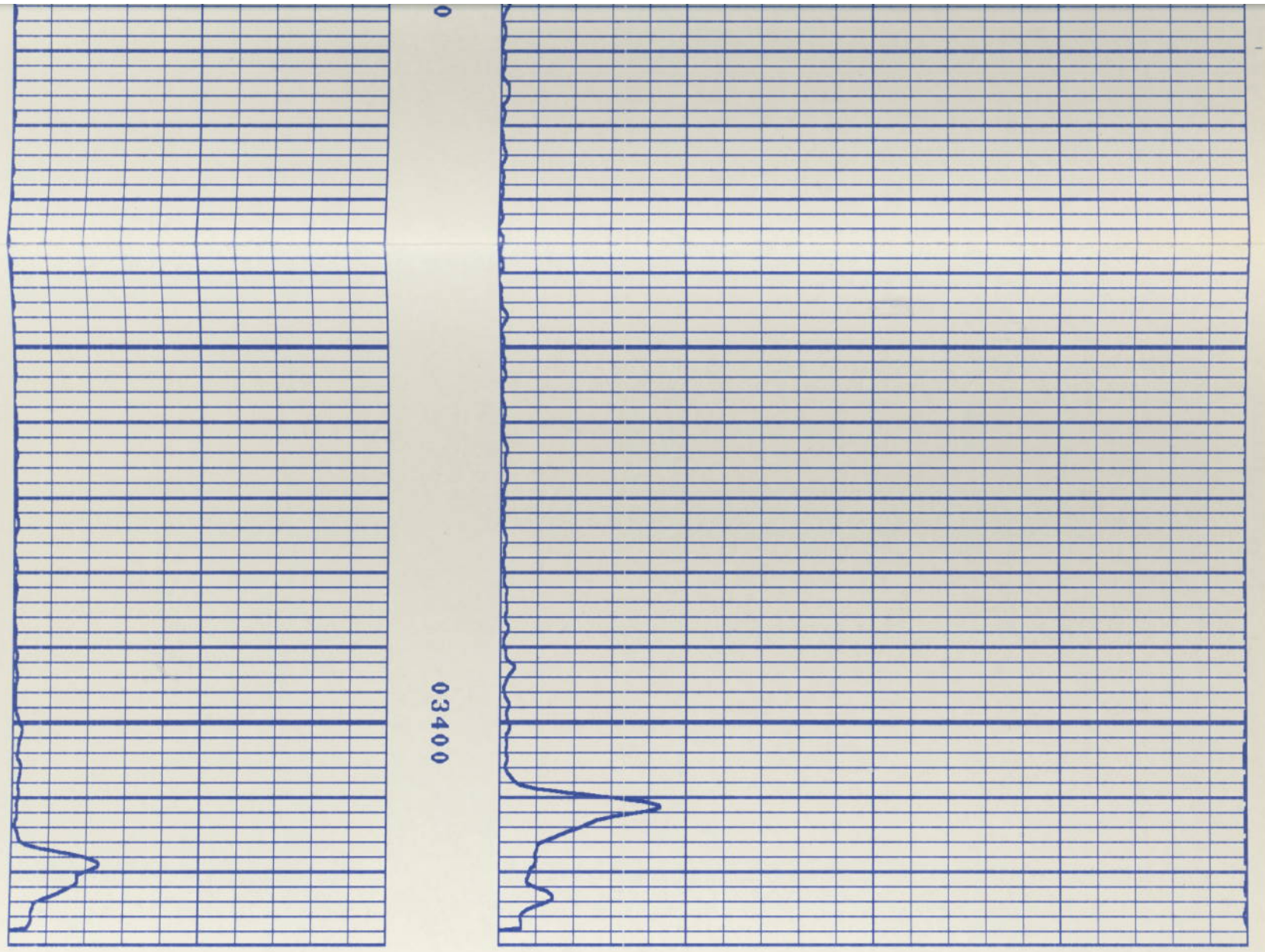
FIRST SLUG SHOT AT 3000'
INJECTION RATE WAS 10 G.P.M.
SEVEN PASSES WERE MADE NO CHANNEL
WAS DETECTED.
FILES: 8-14



03100

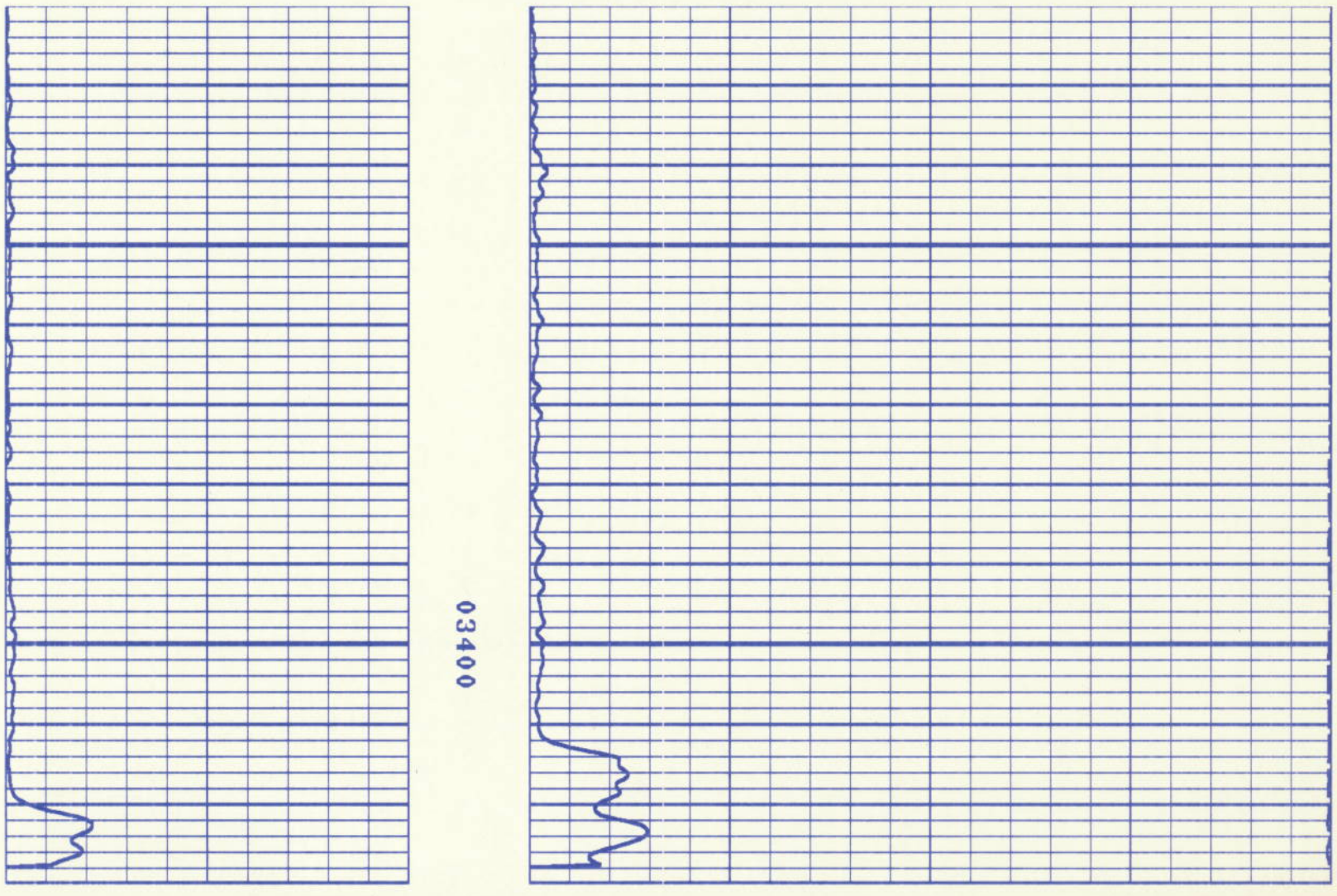
03200

03300


0
03400
CCL
0100
TEN (LBS)
5000
0
TDET (CPS)
0
500
BDET (CPS)
0
500

FILE: 14

****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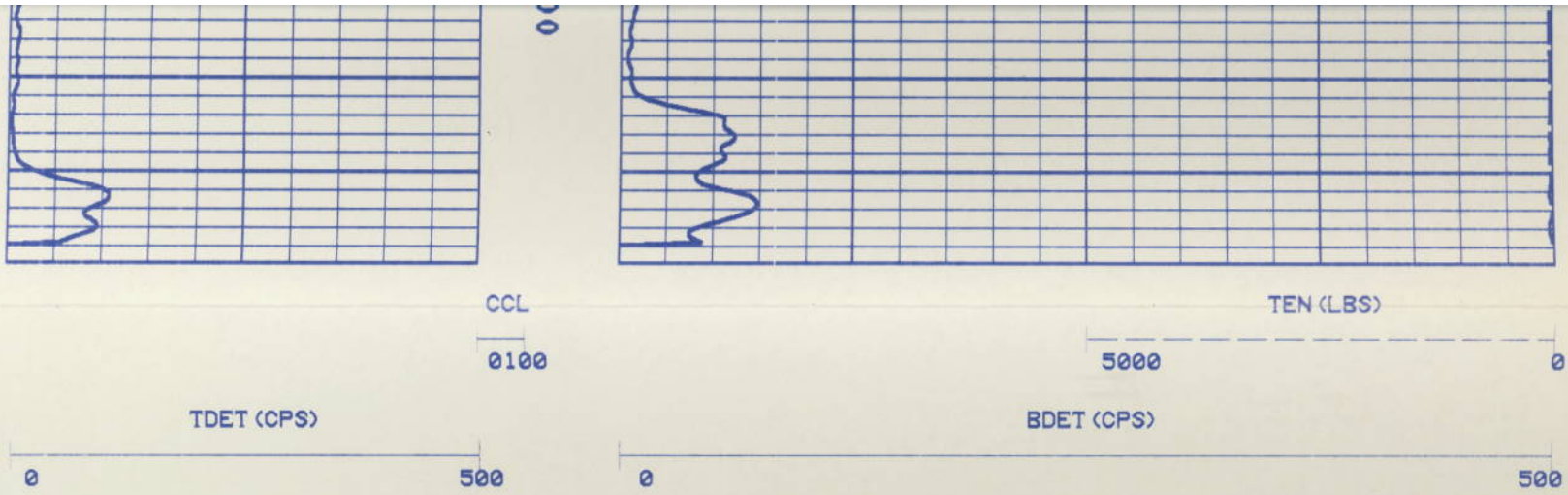

FILE: 13

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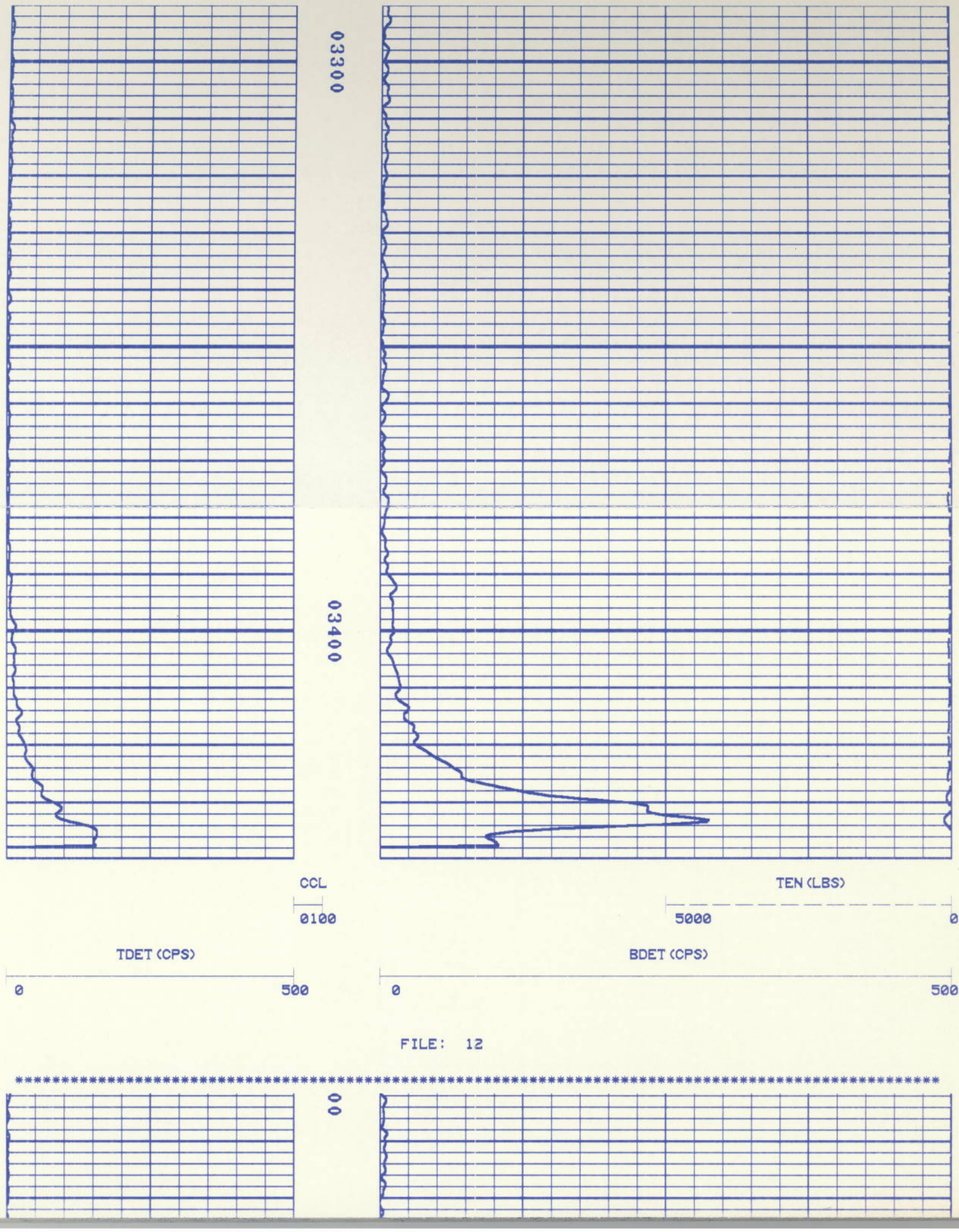

FILE: 12

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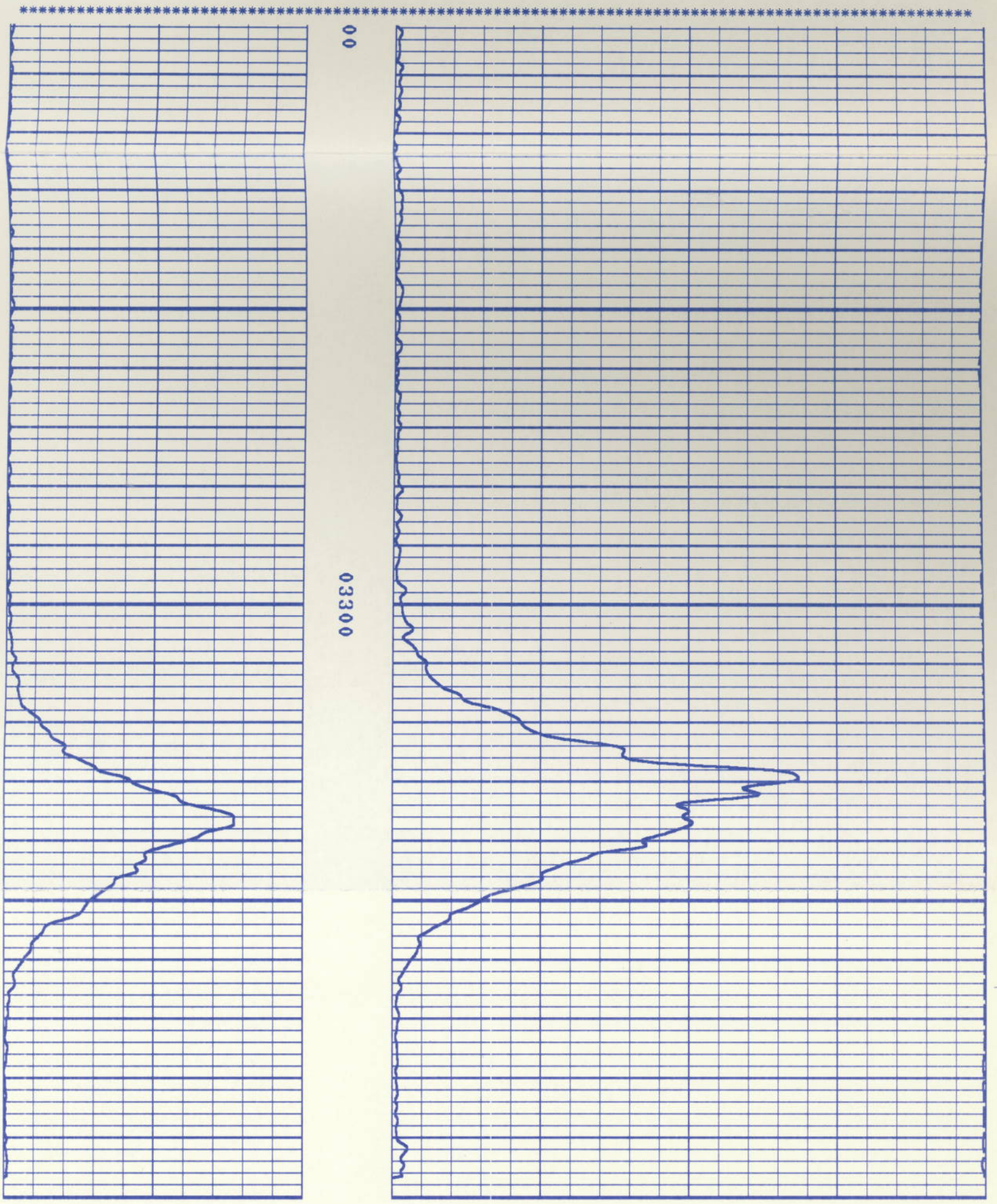
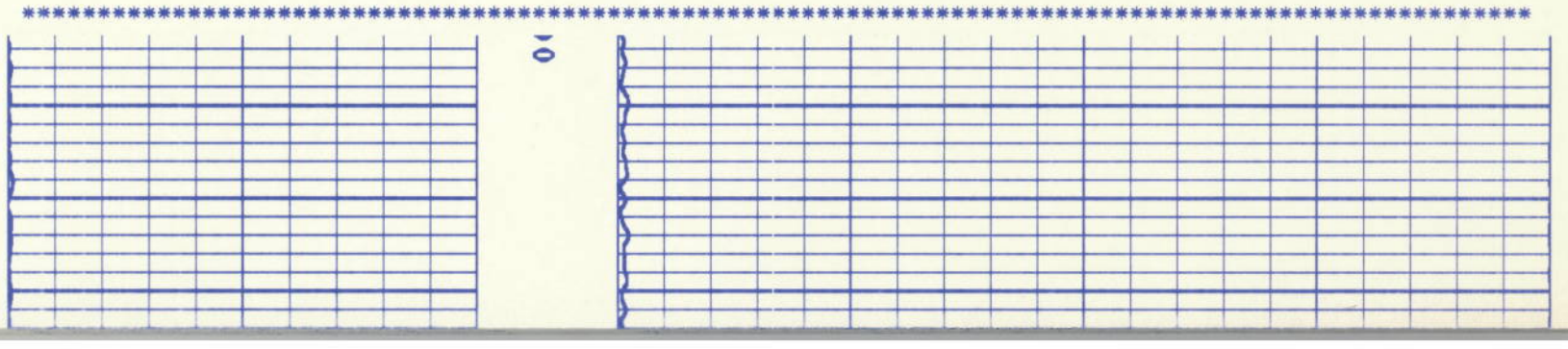
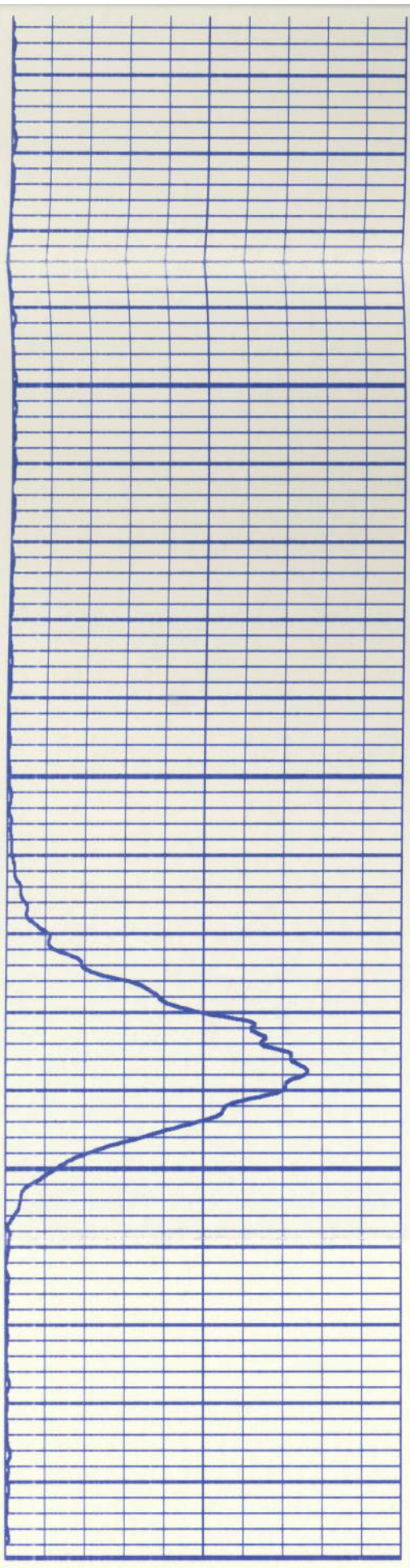
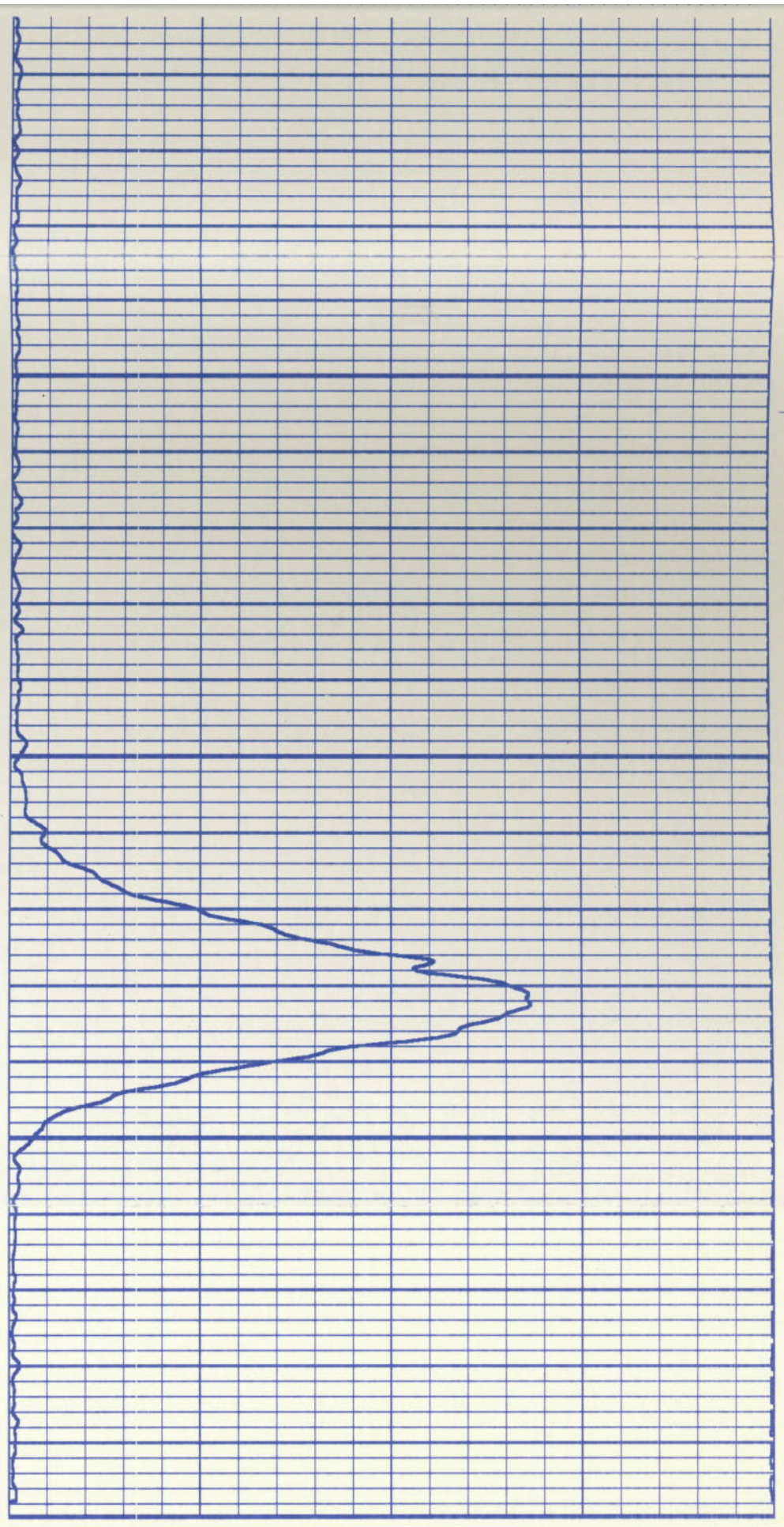
FILE: 12



FILE: 11







0200

CCL

0100

TEN (LBS)

5000

0

TDET (CPS)

0

500

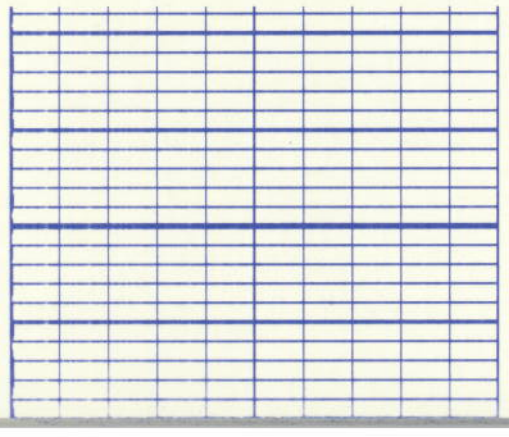
BDET (CPS)

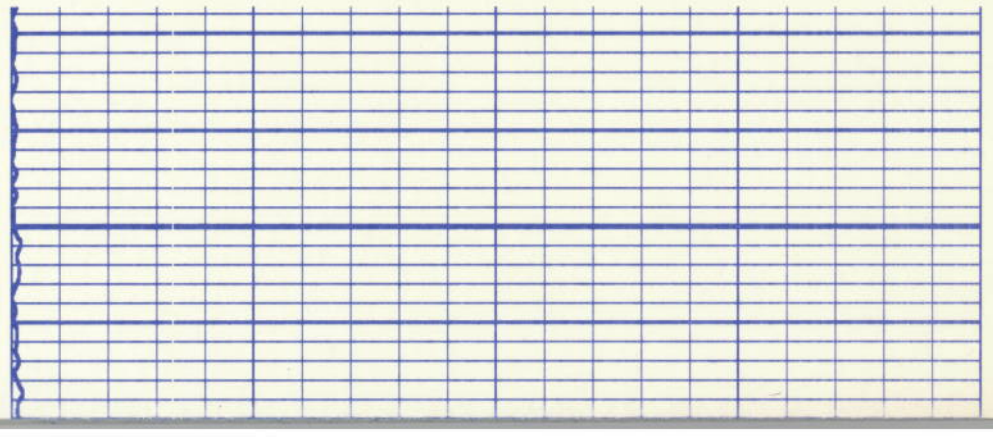
0

500

FILE: 10

****





03100

CCL

0100

TEN (LBS)

5000 0

TDET (CPS)

0 500

BDET (CPS)

0 500

FILE: 9

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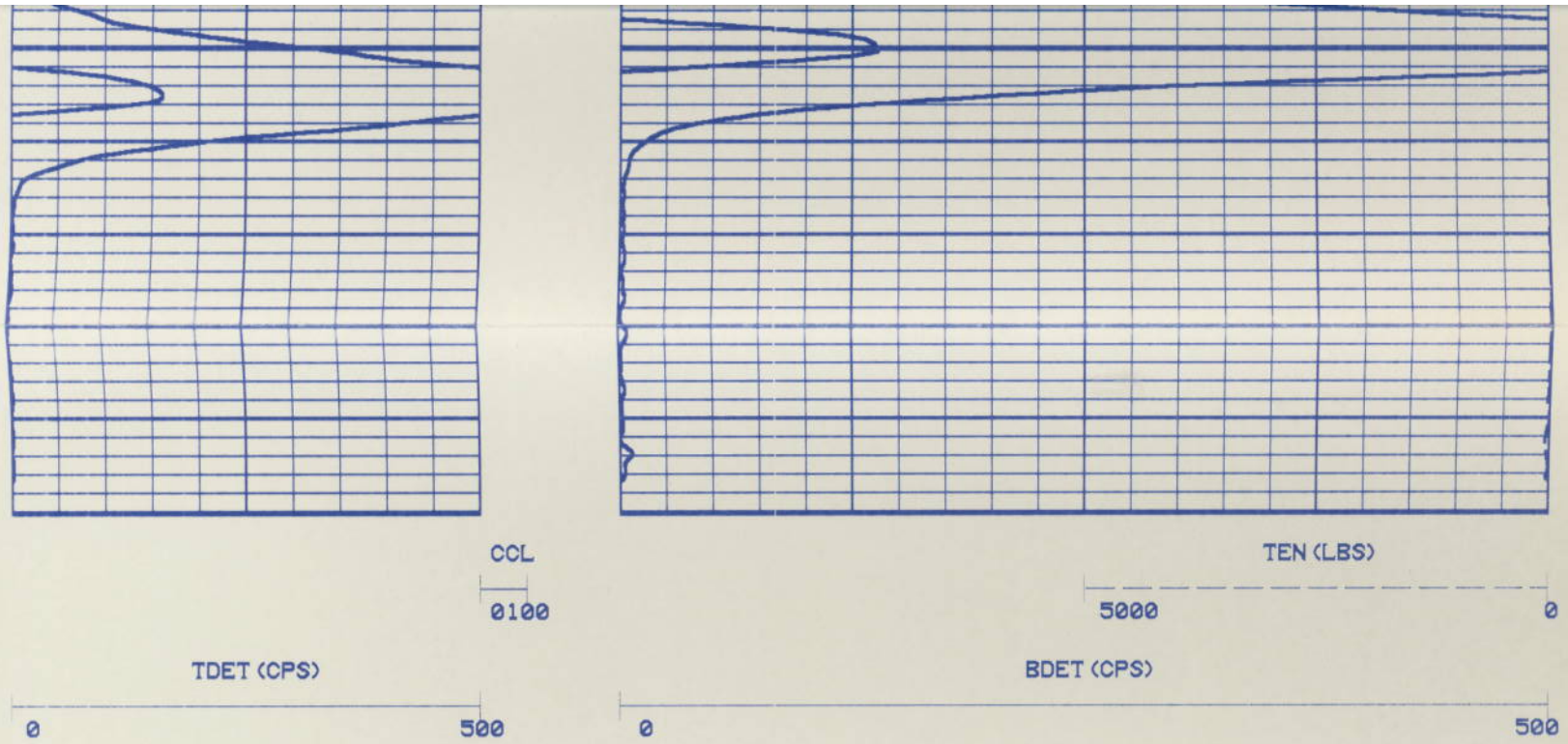
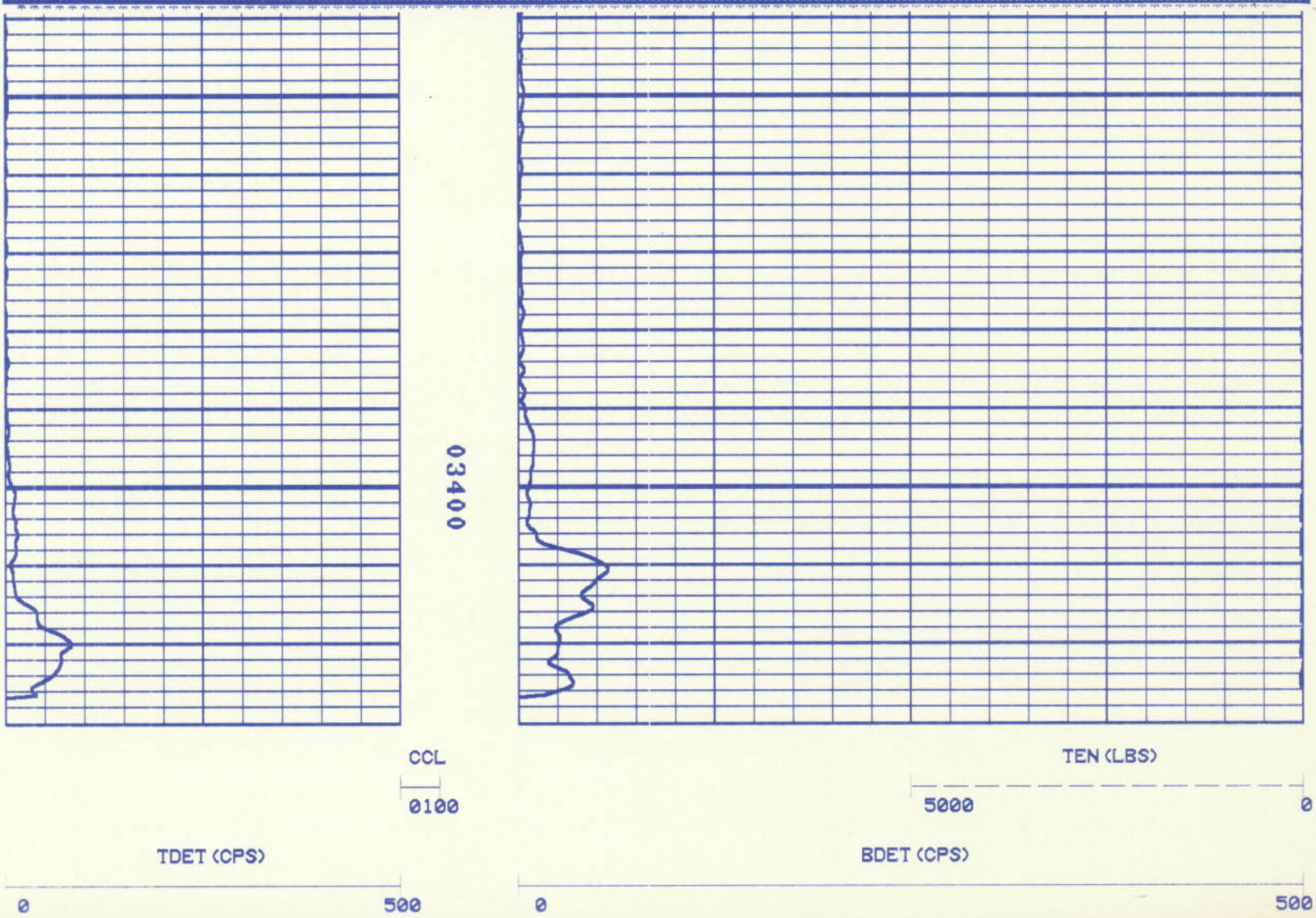
00

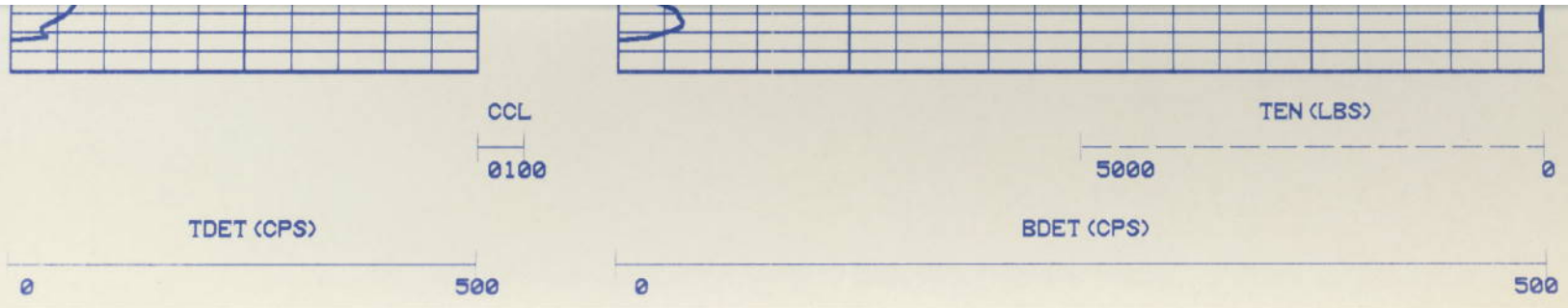


FILE: B

****

SECOND SLUG SHOT AT 3000'
INJECTION RATE WAS 10 G.P.M.
SEVEN PASSES WERE MADE NO CHANNEL
WAS DETECTED.
FILES: 15-21





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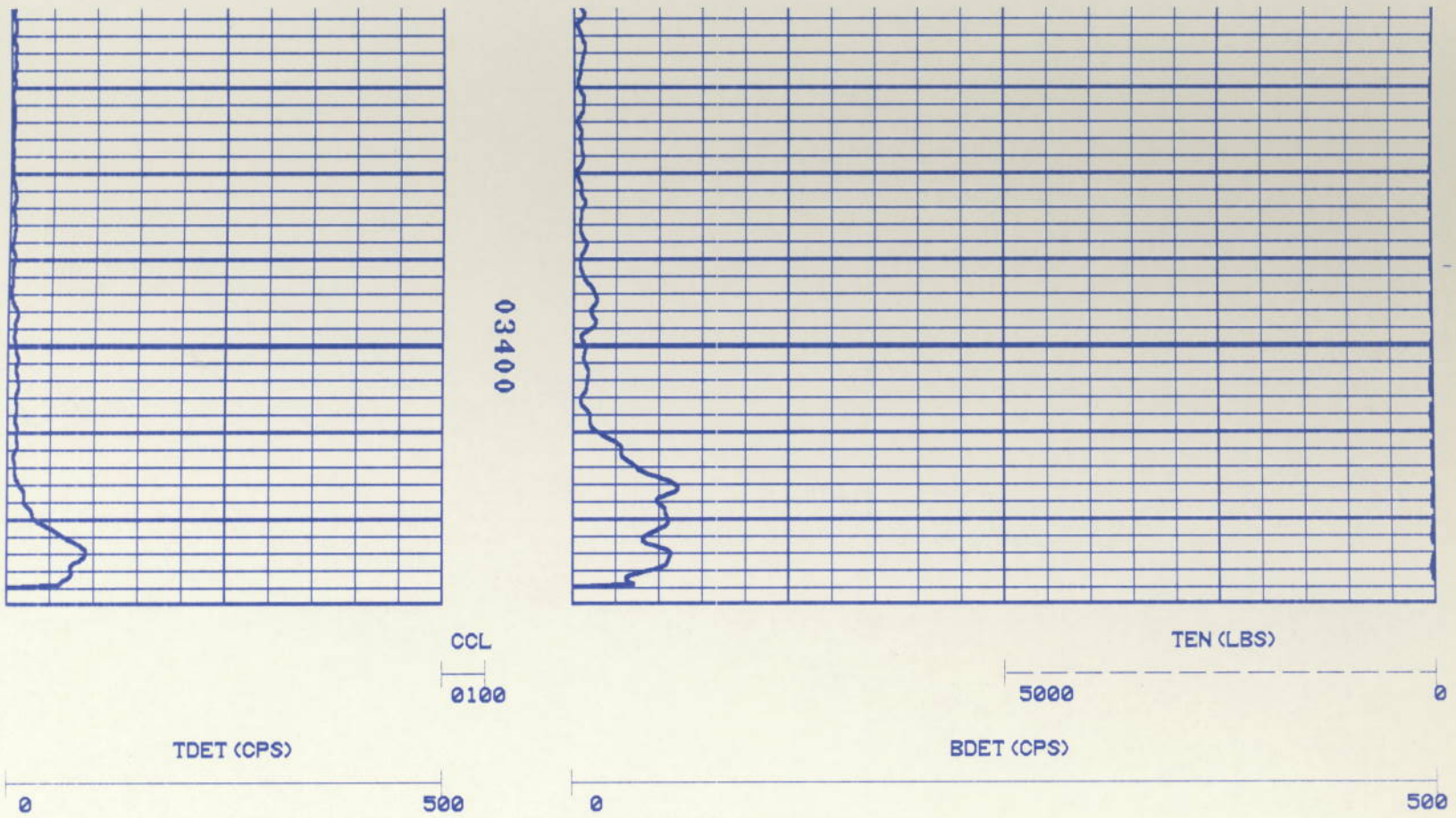

FILE: 20

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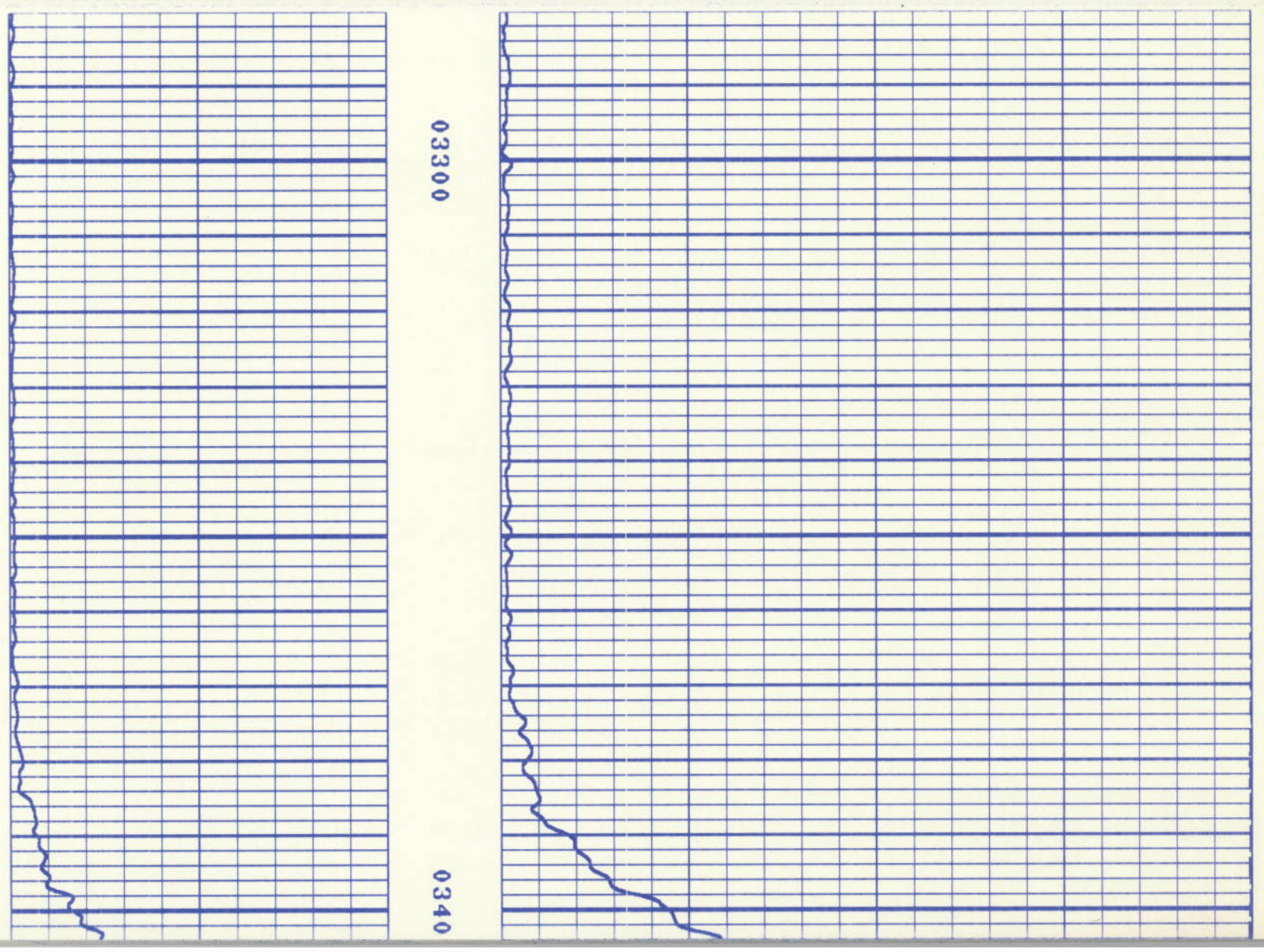
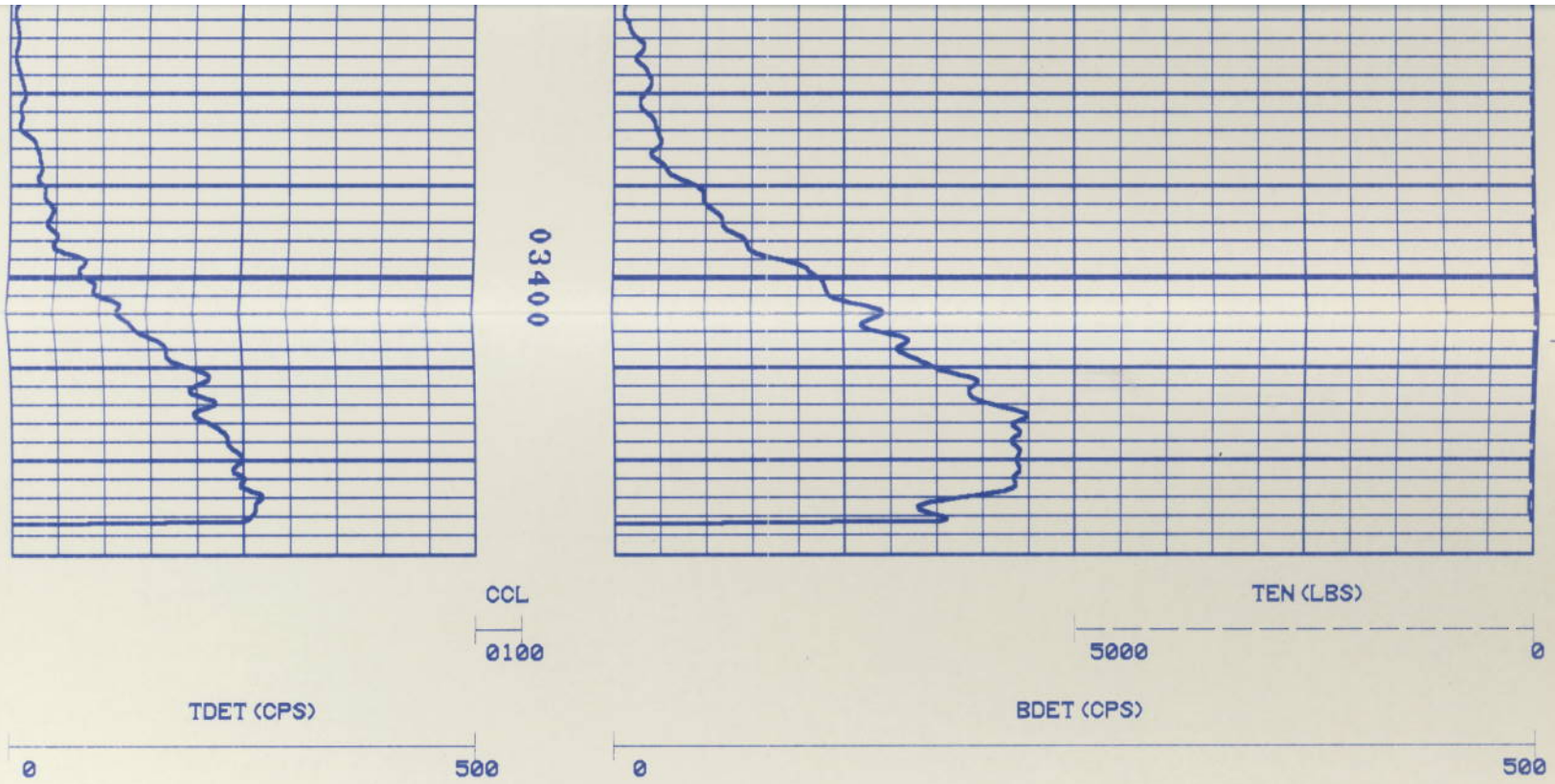
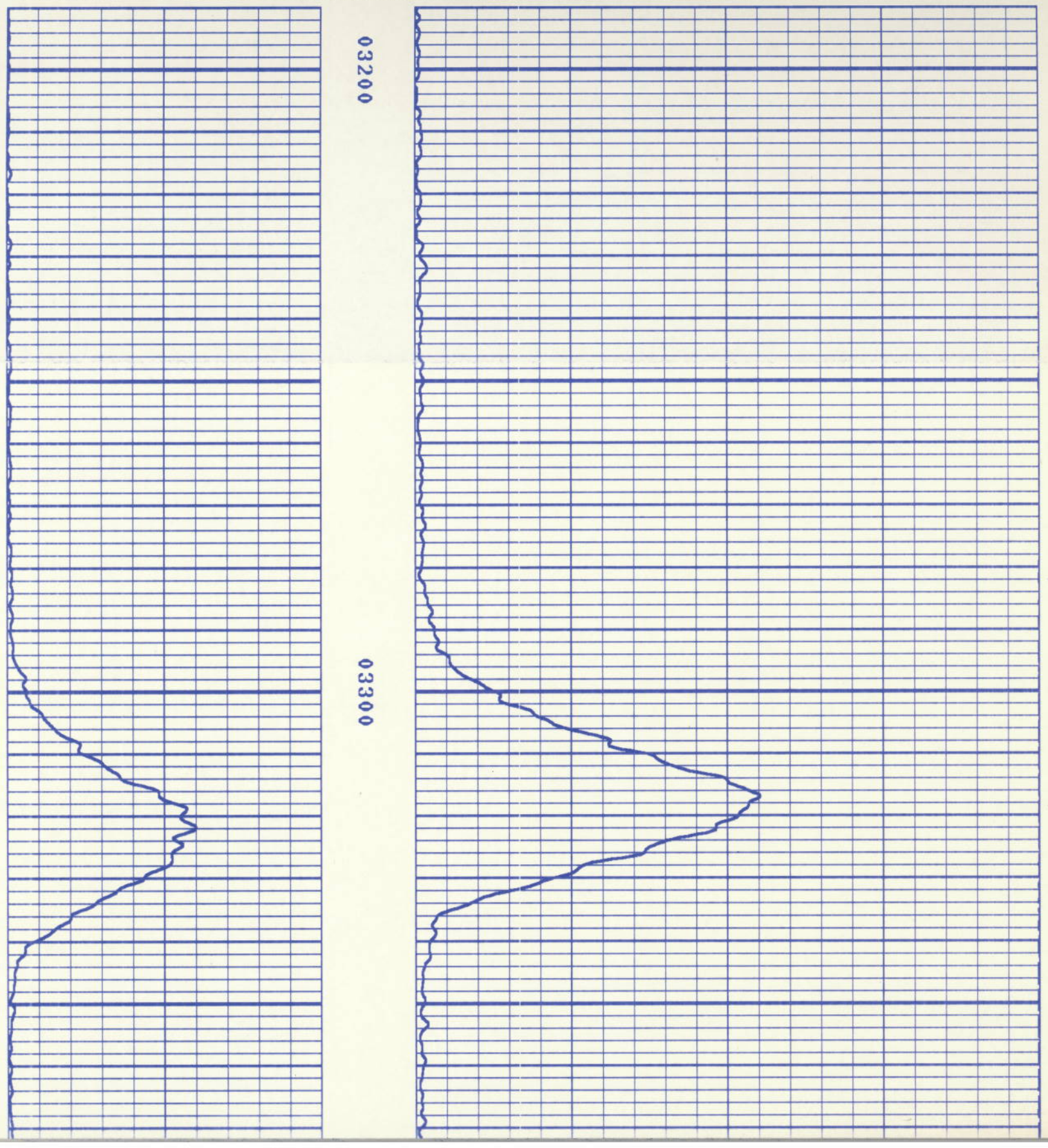



03400
CCL
0100
TEN (LBS)
5000
0
TDET (CPS)
0
500
BDET (CPS)
0
500

FILE: 19

****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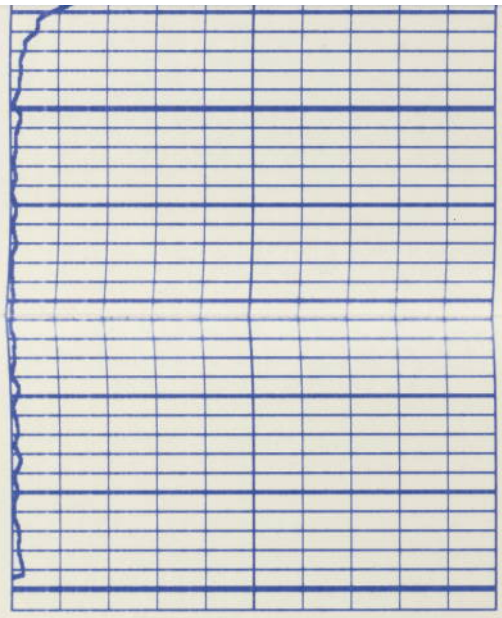
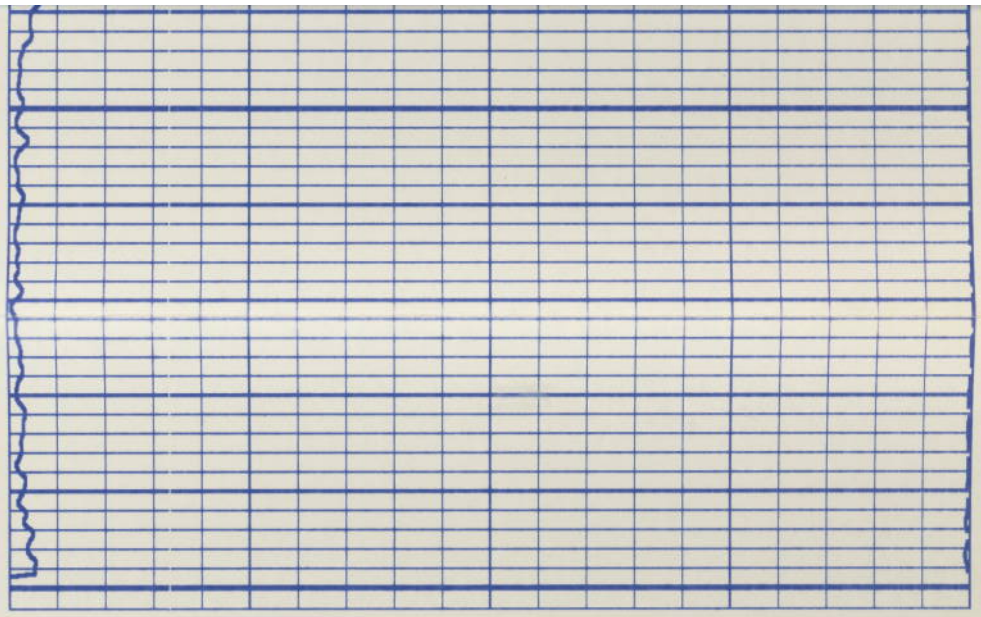
03300





CCL

0100

TEN (LBS)

5000

0

TDET (CPS)

0

500

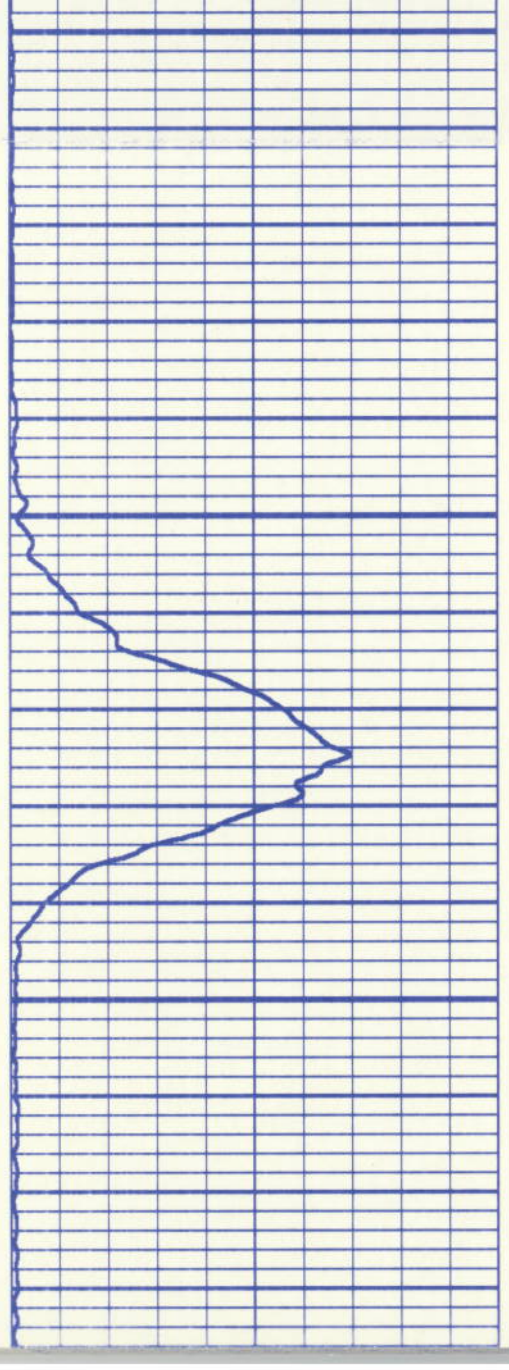
BDET (CPS)

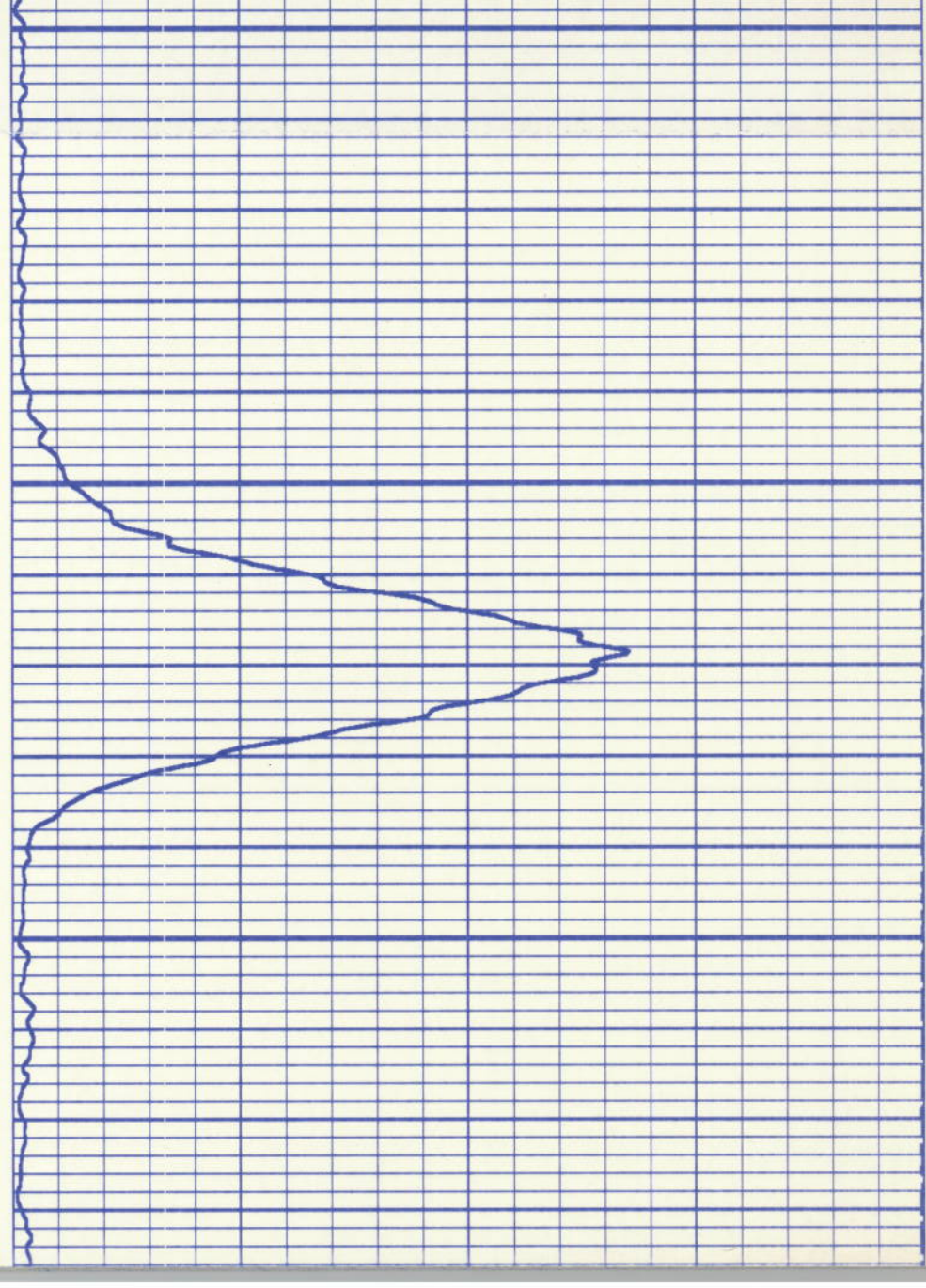
0

500

FILE: 18

****





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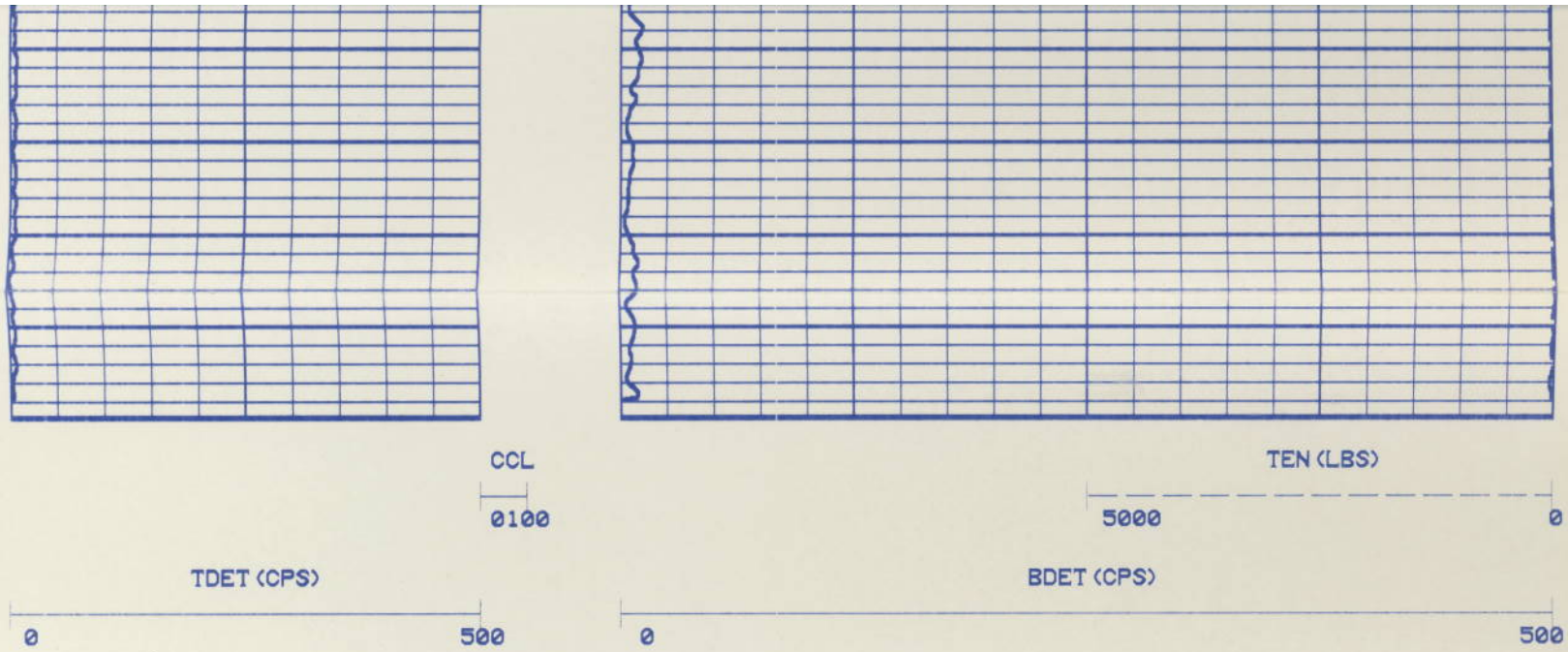

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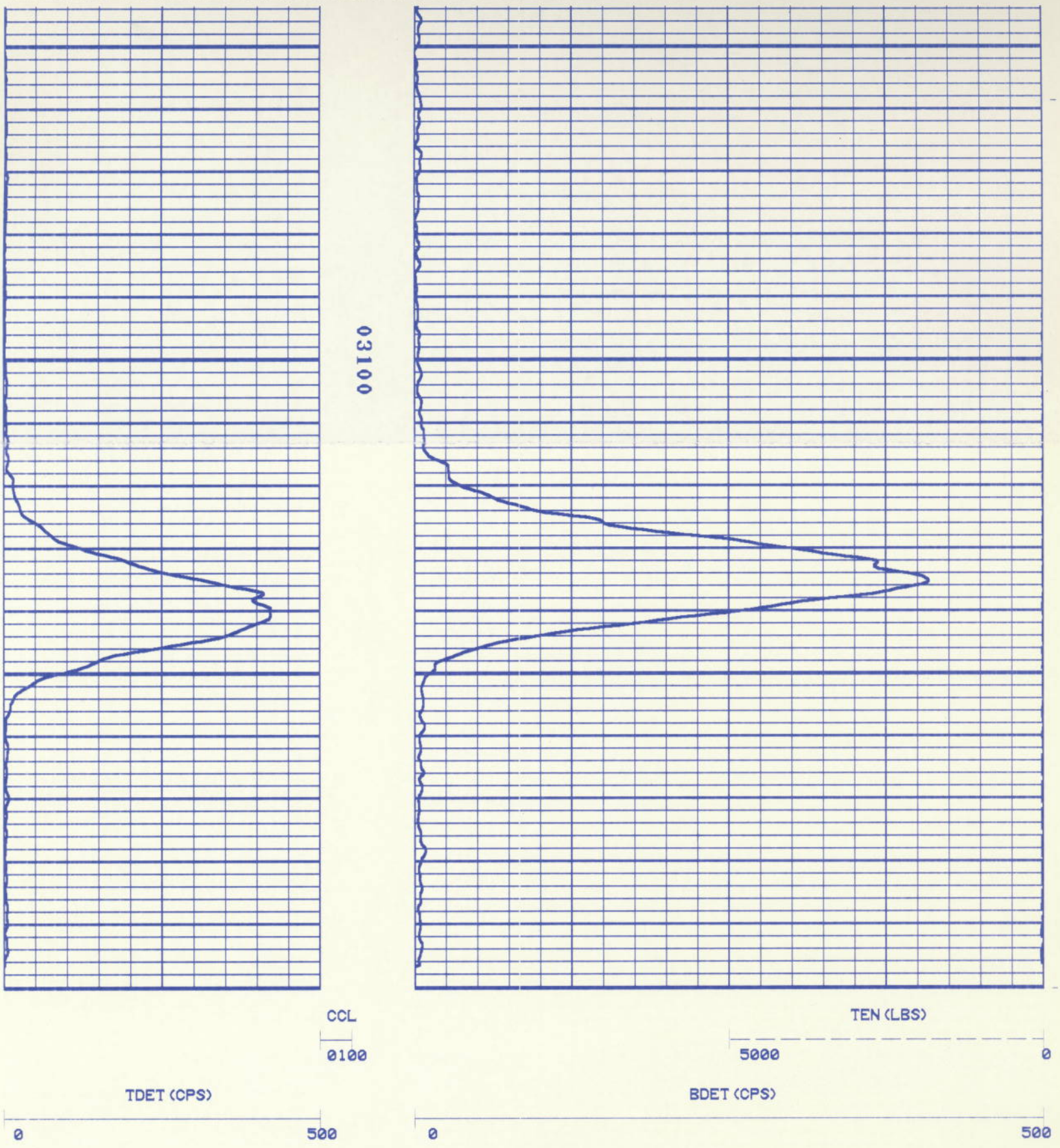


FILE: 16

CCL

0100

TDET (CPS)

0 500

TEN (LBS)

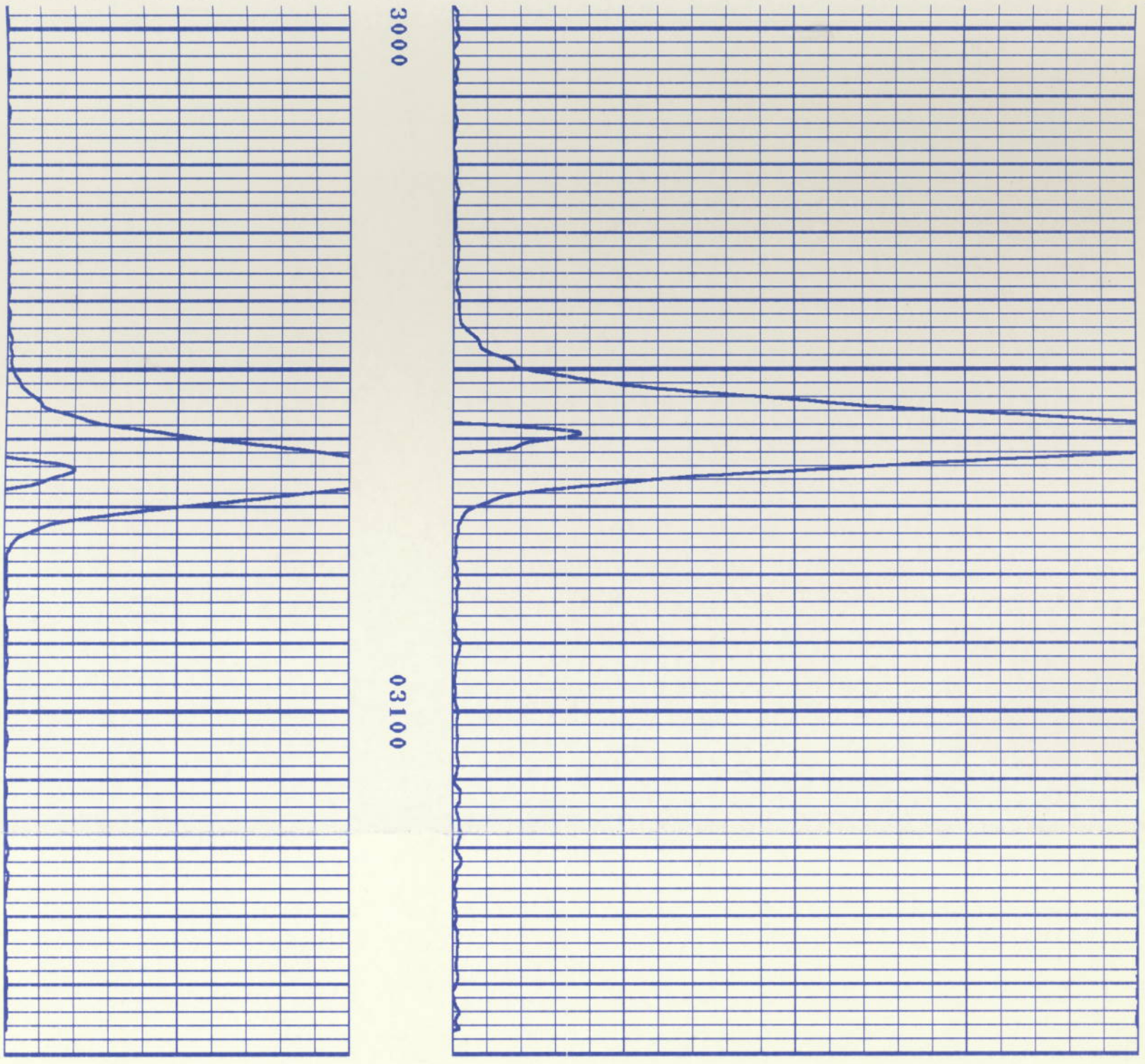
5000 0

BDET (CPS)

0 500

FILE: 16

****



CCL

0100

TDET (CPS)

0 500

TEN (LBS)

5000 0

BDET (CPS)

0 500

FILE: 15

****

TOOL STATIONARY AT 3348
TIME DRIVE IS EQUAL TO 60' / MIN
SLUG FIRED WHILE TOOL STATIONARY

TOOL STATIONARY AT 3348
TIME DRIVE IS EQUAL TO 60′ / MIN
SLUG FIRED WHILE TOOL STATIONARY
NOTE* INJECTION RATE CHANGE FROM
10 GPM TO 120 GPM DURING CHANGE EJECTOR
LEAKED R/A NOTE BOTTOM DETECTOR.

FILE: 22

COMPANY: HOECHST CELANESE CORP.

WELL NAME: WELL NO.4

SERVICE: F 150A FILE: 22

REVISION: FSYS256 REV:G002 VER:2.0

DEPTH: 3348

DATE: 03/11/94

RUN: 1

TRIP: 1

TIME: 13:51:33

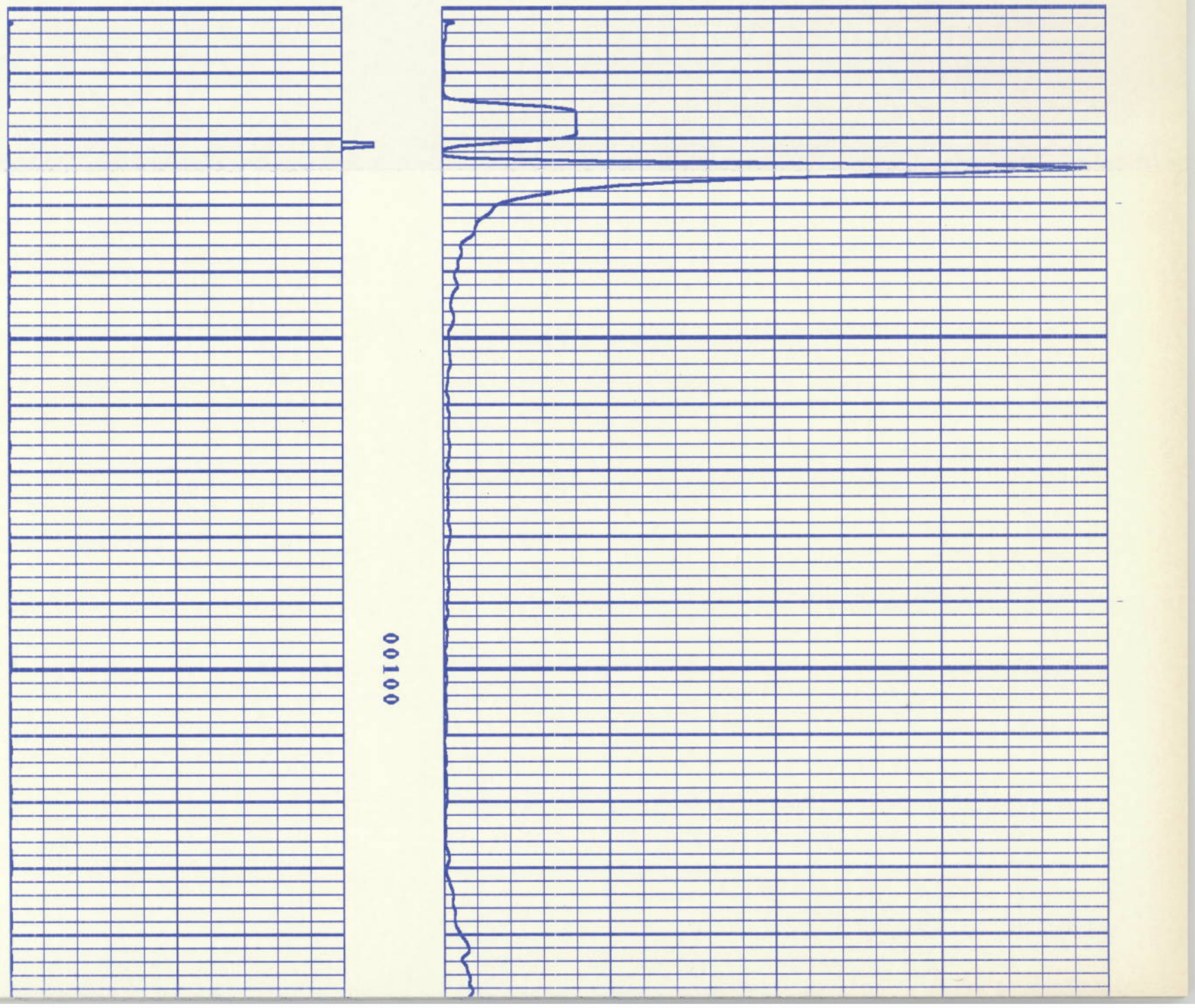
MODE: RECORD

TDET (CPS)
0 500

CCL
0100

BDET (CPS)
0 500

TEN (LBS)
5000 0



00200

00300

00

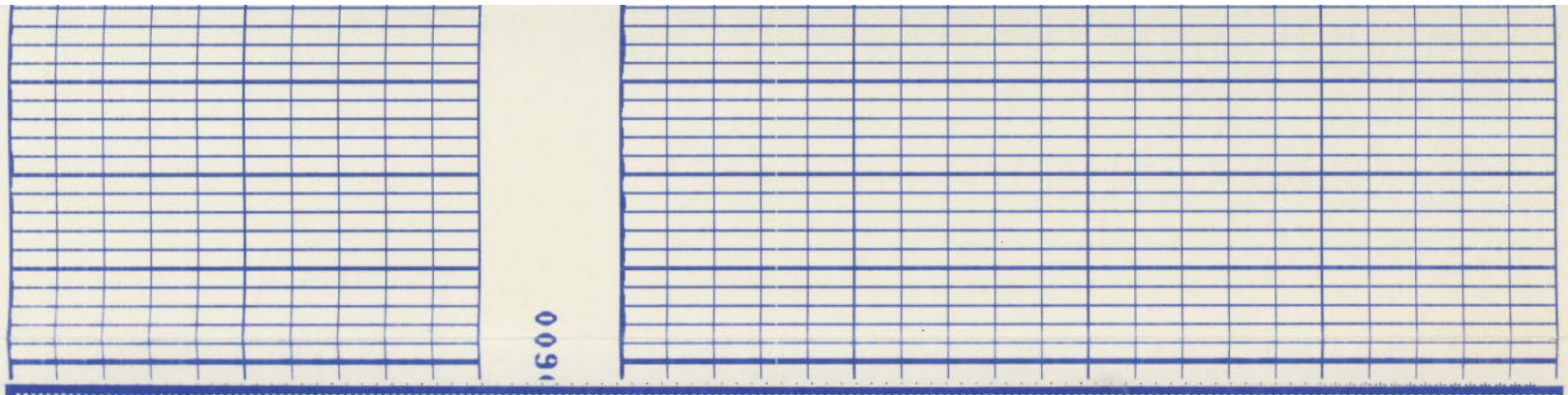
00600

00500

00400

00700

00800



REPEAT SECTION
TOOL STATIONARY AT 3348
TIME DRIVE IS EQUAL TO 60' / MIN.
INJECTION RATE IS 120 G.P.M.
SLUG FIRED WHILE TOOL IS STATIONARY
NO CHANNEL DETECTED.

****

FILE: 23

COMPANY: HOECHST CELANESE CORP. RUN: 1

WELL NAME: WELL NO.4 TRIP: 1

SERVICE: F 150A FILE: 23 DATE: 03/11/94 TIME: 14:07:10

REVISION: FSYS256 REV:G002 VER:2.0 MODE: RECORD

DEPTH: 3348

TDET (CPS)

0 500

CCL

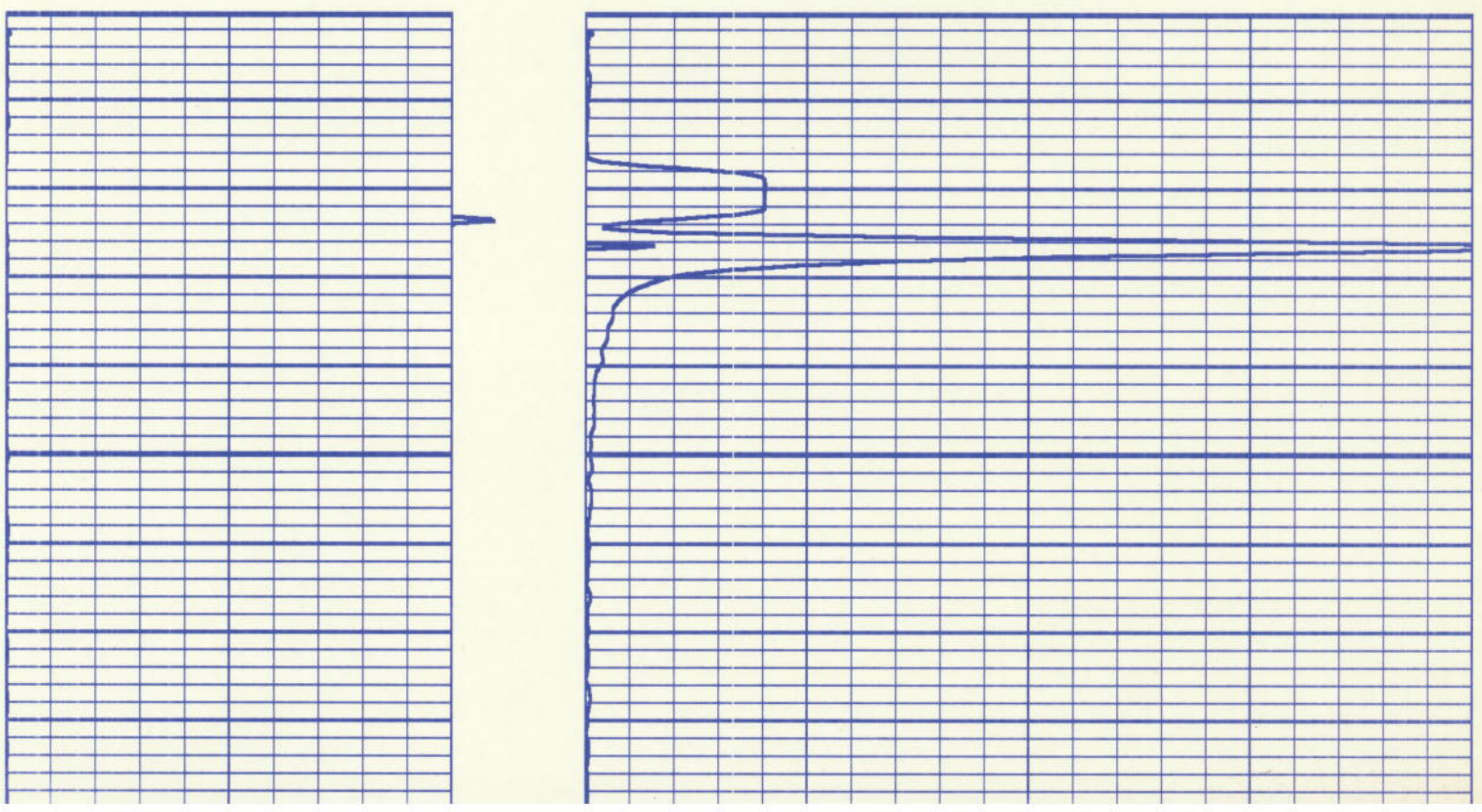
0100

BDET (CPS)

0 500

TEN (LBS)

5000 0



00100

00200

00300

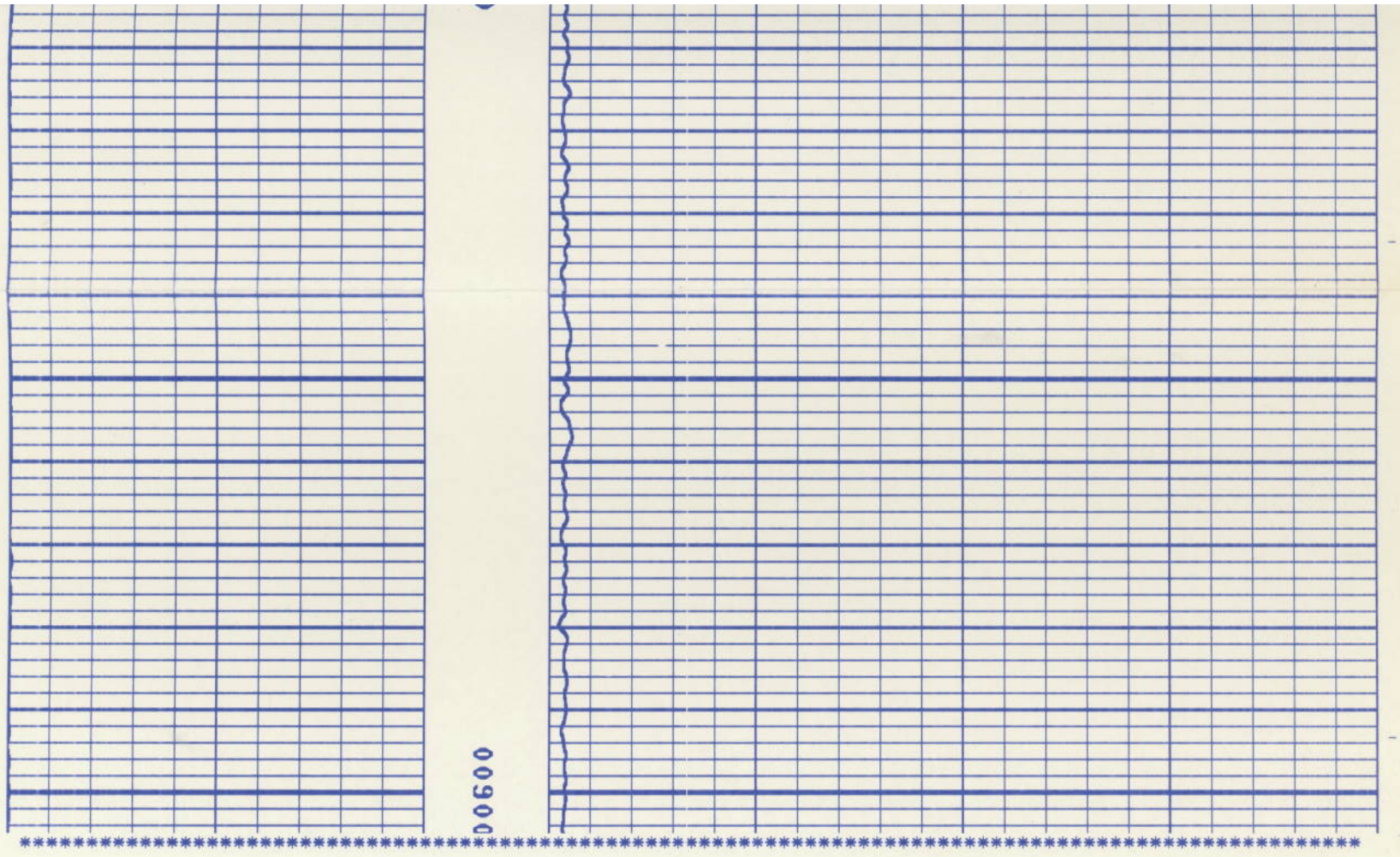
00400

00500

00600

00700

00800



REPEAT SECTION
TOOL STATIONARY AT 3358
TIME DRIVE IS EQUAL TO 60' / MIN.
SLUG FIRED WHILE TOOL IS STATIONARY.
NO CHANNEL DETECTED.
INJ. RATE 120 G.P.M.

FILE: 24

COMPANY: HOECHST CELANESE CORP.

WELL NAME: WELL NO.4

SERVICE: F 150A FILE: 24 DATE: 03/11/94

REVISION: FSYS256 REV:G002 VER:2.0

DEPTH: 3359

RUN: 1

TRIP: 1

TIME: 14:23:02

MODE: RECORD

TDET (CPS)
0 500

CCL
0100

BDET (CPS)
0 500

TEN (LBS)
5000 0

TDET (CPS)

0 500

CCL

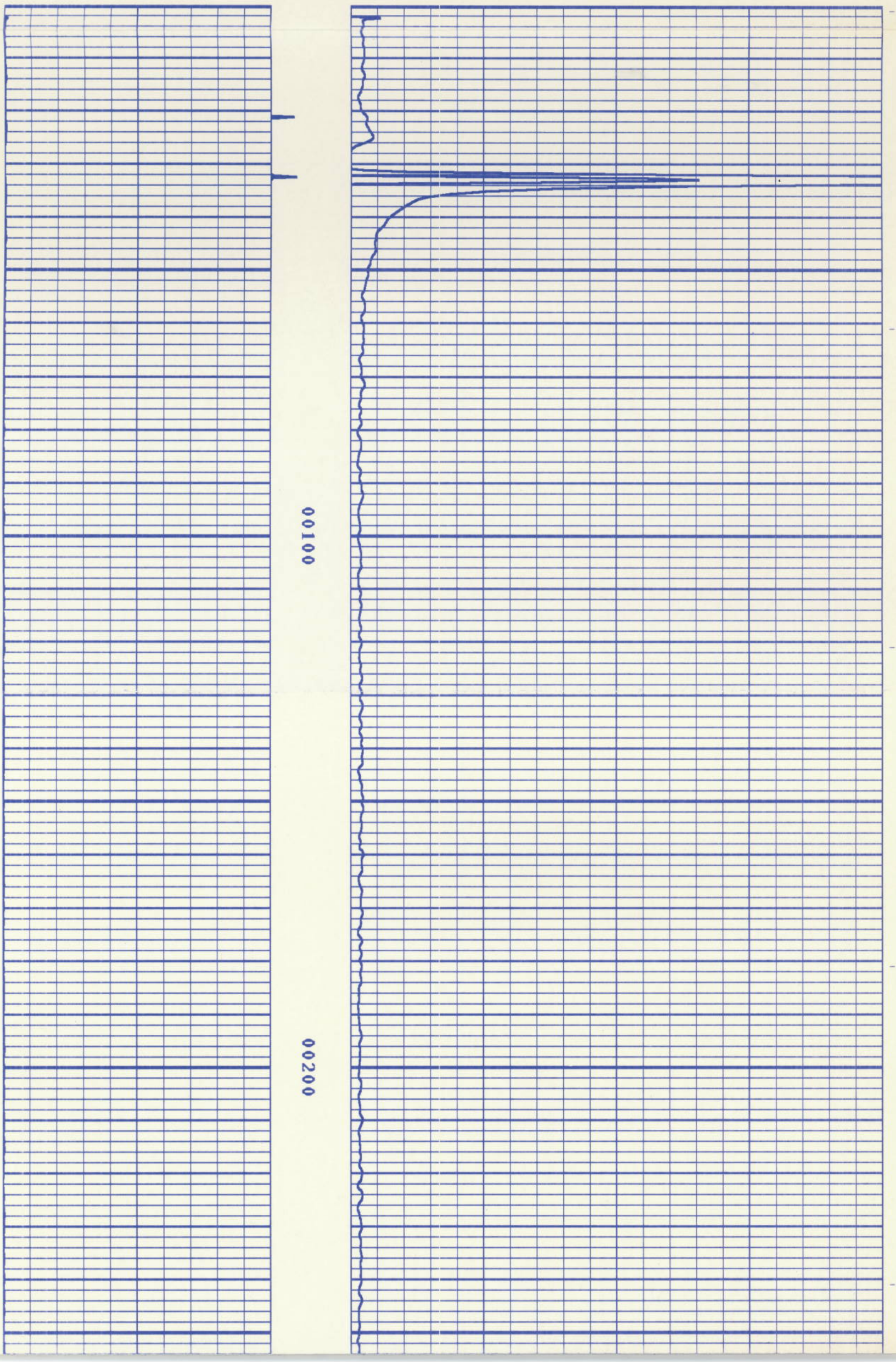
0100

BDET (CPS)

0 500

TEN (LBS)

5000 0



00300

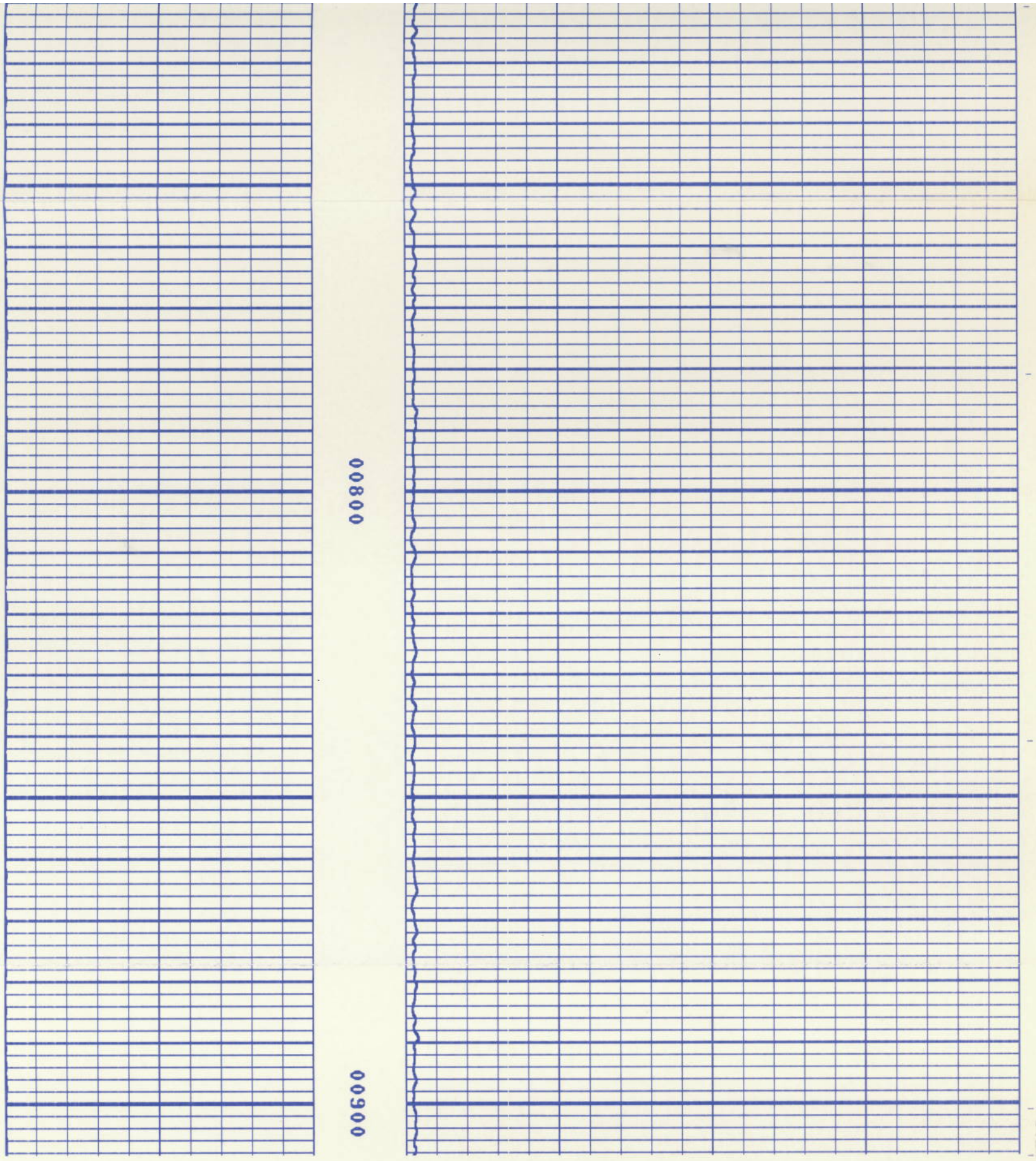
00400

0050

00700

00600

00500



AFTER INJECTION BACKROUND GAMMA RAY PAS

****

FILE: 25

PARAMETERS

*** NONE ***

FILE: 25

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

WELL NAME: WELL NO.4

SERVICE: F 150A FILE: 25 DATE: 03/11/94

REVISION: FSYS REV. J001 VER. 1.1

RUN: 1

TRIP: 1

TIME: 14:41:21

MODE: PLAYBACK

CCL

100

TDET (CPS)

0 500

BDET (CPS)

0 500

02800

02900

03000

03100

03

BDET (CPS)

03200

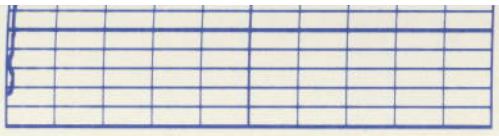
03300

03400

CCL

100

TDET (CPS)

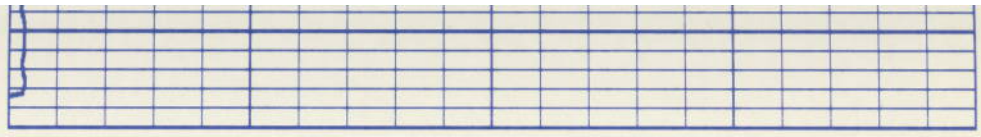


CCL

100

TDET (CPS)

0 500



BDET (CPS)

0 500

FILE: 25

****

BACKGROUND GAMMA RAY LOG API BEFORE INJECTION

****

FILE: 2

PARAMETERS

*** NONE ***

DISPLAY SCALE CHANGES

*** NONE ***

COMPANY: HOECHST CELANESE CORP.

WELL NAME: WDW WELL NO.4

SERVICE: F 159P FILE: 2 DATE: 03/11/94

REVISION: FSYS REV. J001 VER. 1.1

RUN: 1

TRIP: 1

TIME: 11:25:53

MODE: PLAYBACK

CCL

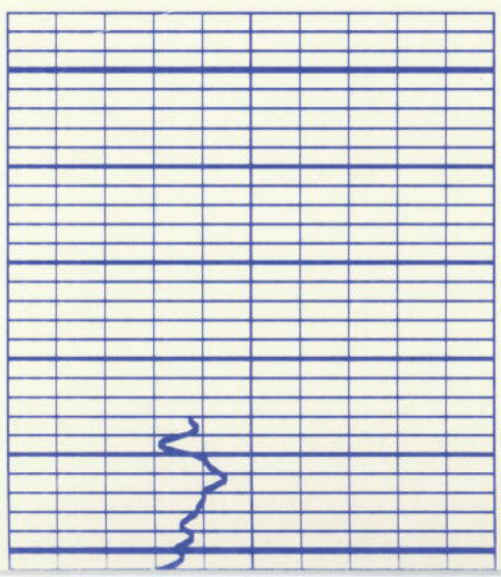
100

GR (API)

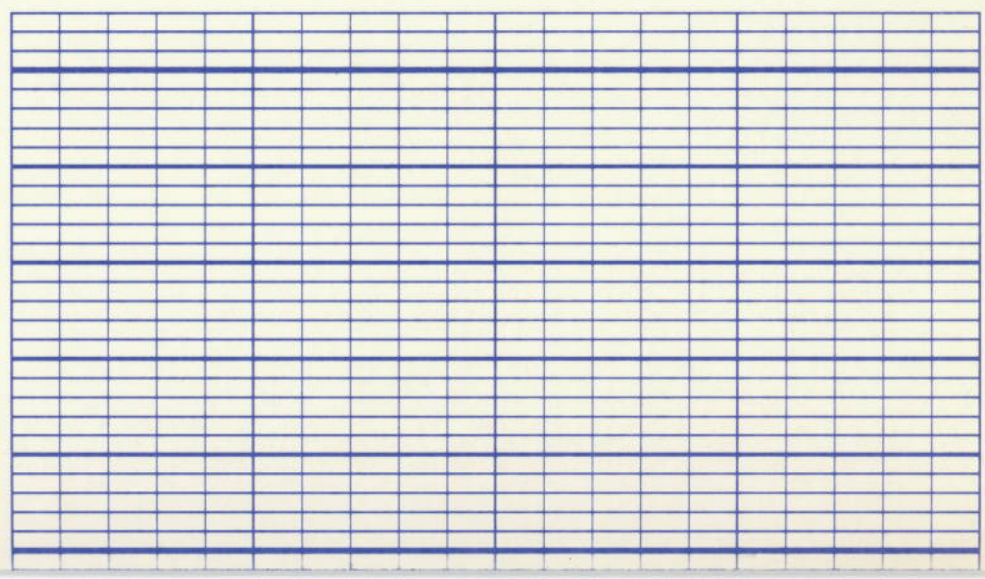
0 100

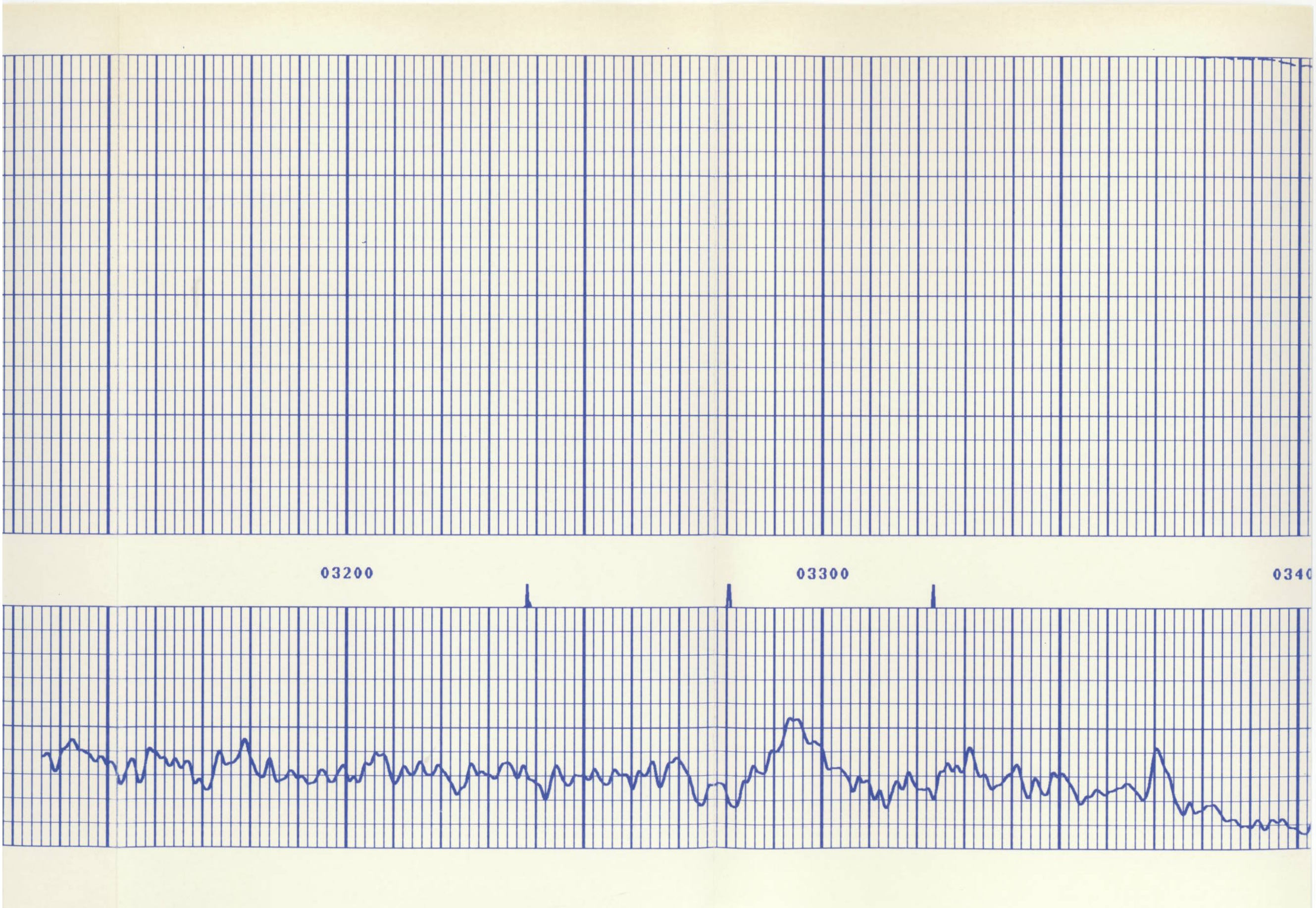
TEN (LBS)

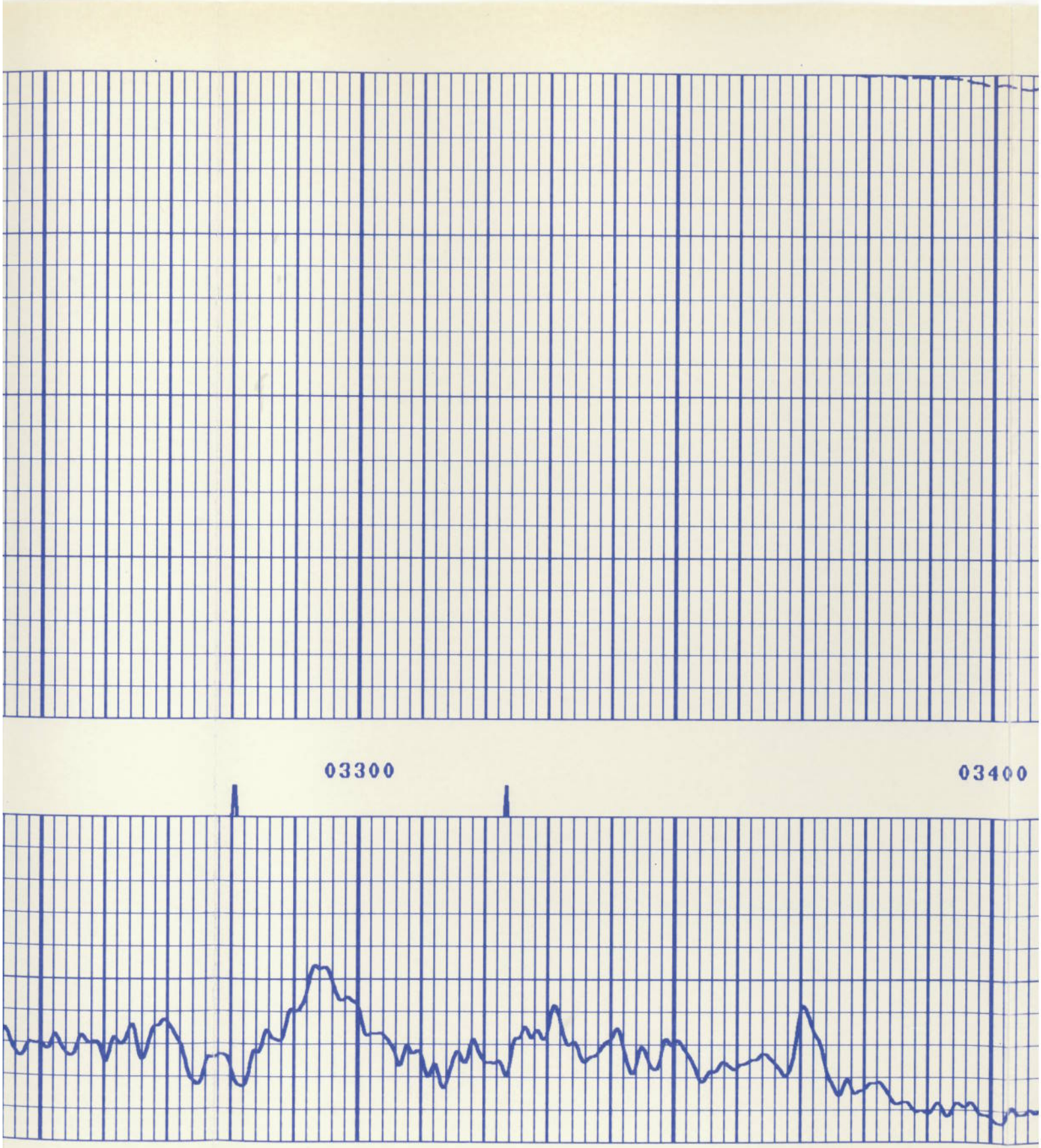
1000 0



03100




03200
03300
0340


03300
03400